THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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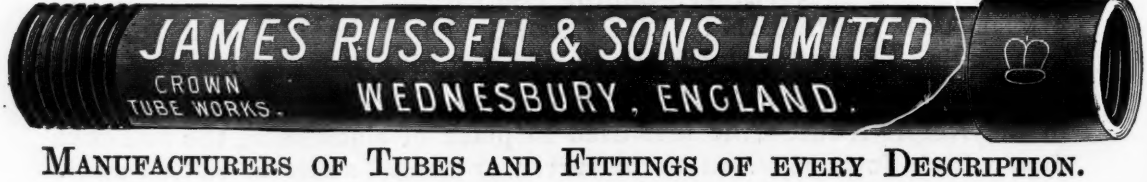

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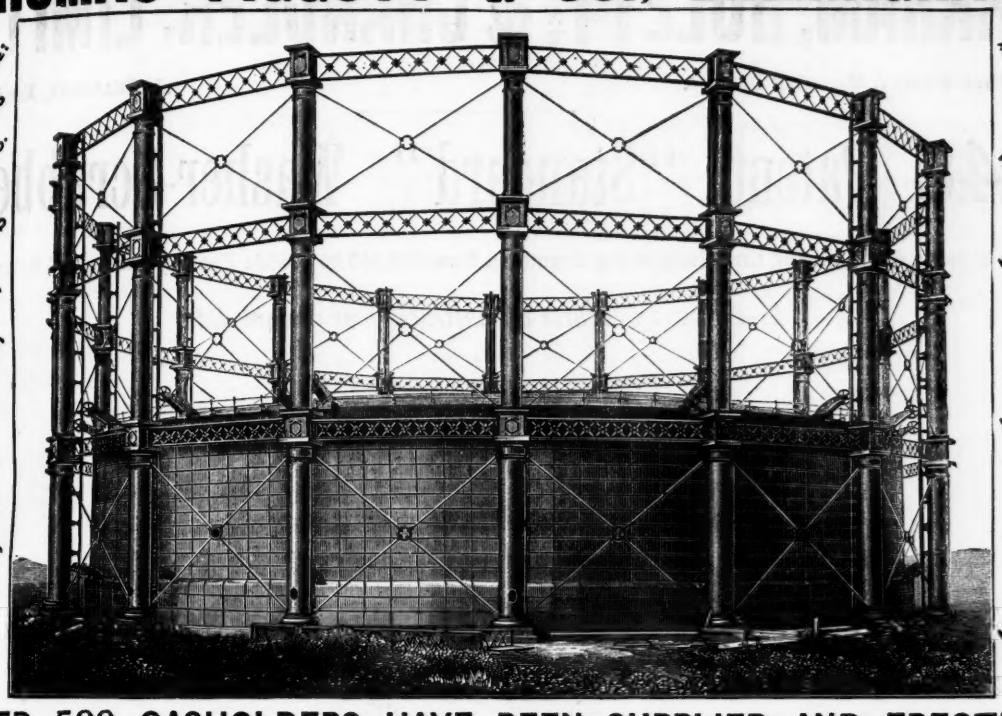

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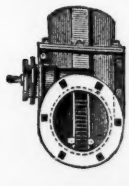

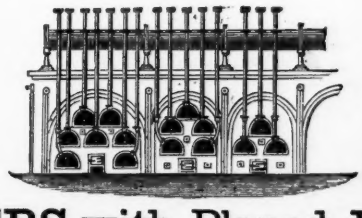

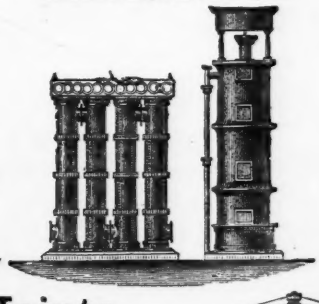

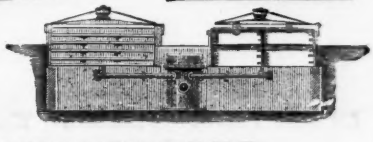

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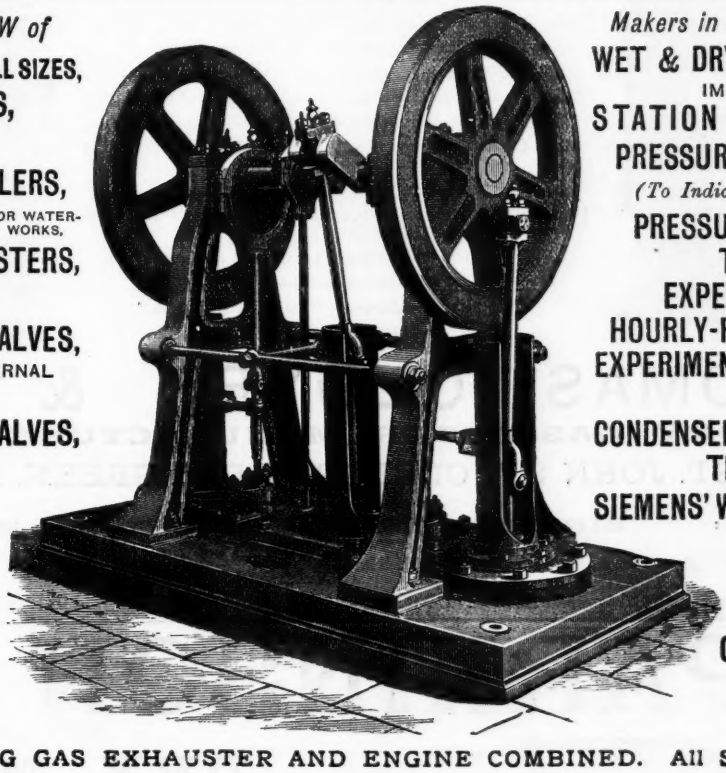

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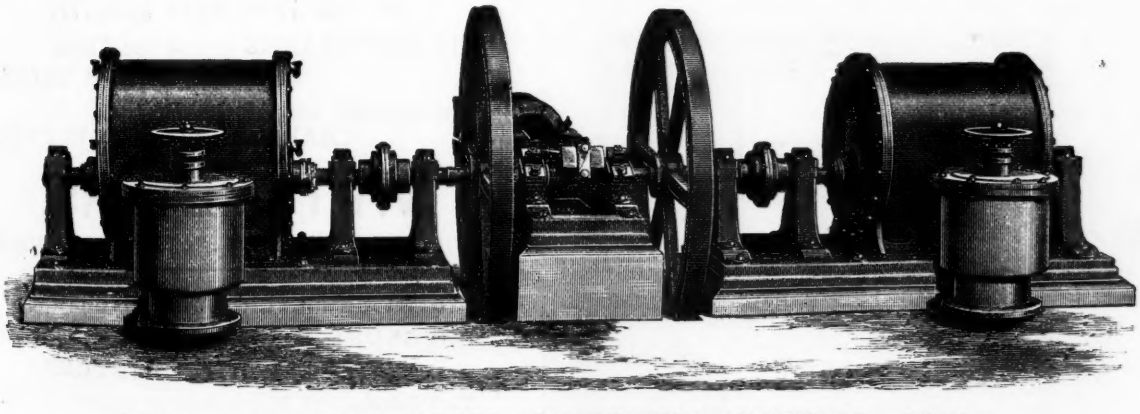

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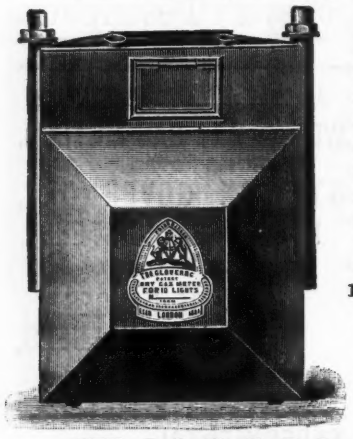

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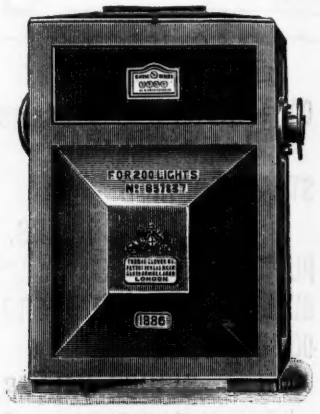

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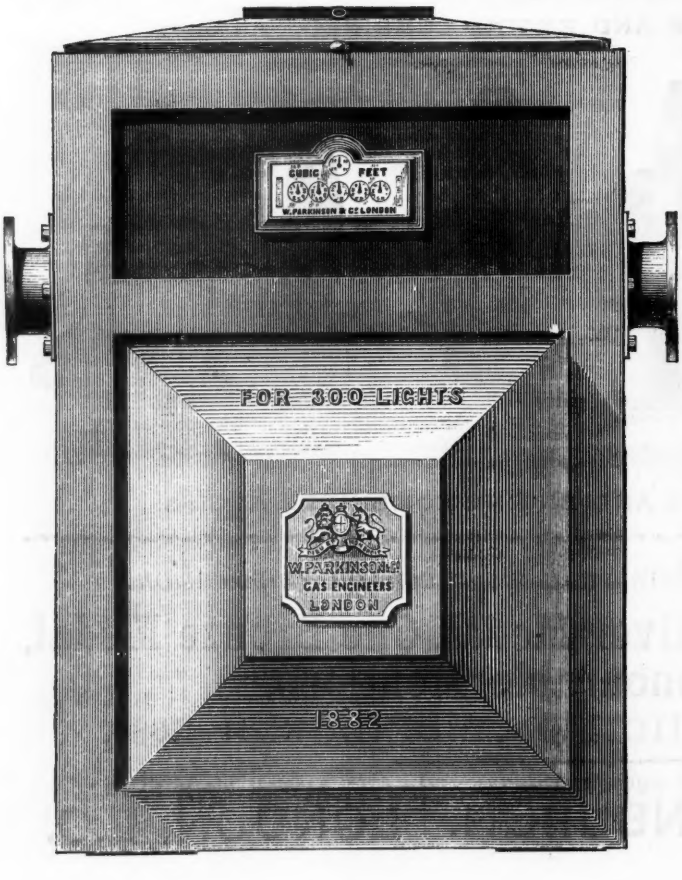

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 12, 1892.

The Plaint of the Unemployed.

WHILE the Durham Miners' strike is dragging itself out to an exceedingly "bitter end," there has been a significant recrudescence in the East-end of London of the once familiar "demonstrations of the unemployed." Deputations from meetings so described have sought interviews with the President of the Local Government Board and with the London County Council, and there has been a revival of the demand for the opening of "municipal "workshops" for the purpose of providing employment for the men who, it is alleged, cannot find work to do. Seeing that the bulk of the "unemployed" on whose behalf this petition is raised are admittedly dockers and 'long-shore labourers, it is difficult to realize the sort of municipal workshop in which such men could find congenial tasks. Are London and Newcastle, for example, to send, out of the rates, cargoes of coal backwards and forwards from port to port, for the express purpose of their being loaded and unloaded over and over again? However, this is a detail; and it is the invariable character of Social Democratic schemes to break down in regard to details. Messrs. Mann and Tillett will tell the world any day how to abolish poverty *en bloc;* but it would puzzle them to keep in regular remunerative employment the first street loafer they might meet. It may or may not be true that there is an exceptional amount of distress in the East-end of London and elsewhere, through slackness of trade; but if this is so, is it not at least remotely possible that the vagaries of the North Country miners and East Coast engineers may have something to do with it? It may be noticed that the self-styled friends of the labouring classes talk glibly enough about the desirability of the Federation of Labour, by which they mean the collection of all the actuating wires of Trade Unionism into a handful convenient for manipulation; but they seem incapable of realizing the very close economical connection that actually exists between workers, not merely in the same and in different districts of the same country, but also all over the world. Yet it is perfectly clear, as Lord Derby told an audience of Lancashire operatives some years ago, that a famine in China, which would hardly be reported in the English newspapers, might be the cause of many a Lancashire child going supperless to bed. Much more then is it true that the circulation of hundreds of thousands of pounds in wages cannot be interfered with save at the price of inflicting widespread discomfort. But the demagogues who appear to engross the ear of the workman never take account of such considerations as this, and seem to revel in the spectacle of one set of labourers starving another.

Meanwhile, it would be amusing, if it were not so painful a sight, to mark the struggles of the demagogues not only to keep the favour of the class of men whom they pretend to represent, but also to make this favour worth having. Several mutually antagonistic "leaders" are asserting their right to speak in the name of the "unemployed," and accusing each other of complicity in a "put-up job" devised for private and personal ends. The professional organizers of the newer Unions, moreover, are full of complaints against members for not keeping their tickets paid up; but the slackness of many trades is making it increasingly difficult for these Unions to keep their standing. It is all very well in busy times to form "Trade" Societies of dockers, cement workers, ship scrapers, road sweepers, and so forth; but when slack seasons supervene, what is there to prevent followers of one of this order of "trades" from crowding out the duly inscribed members of another? The out-of-work cement labourer has as good a right to look for a job at the docks, as Mr. Tom Mann (say) has to join the staff of the *Workman's Times* when his own *Trade Unionist* goes to pieces from lack of support. The worst of it is, moreover, from the point of view of the professional agitator, that, with the collapse of the Unions, the number of paid officials must decrease; and who is then to provide for the young men with a turn for mob-oratory, and a disinclination for manual labour, who have taken to this easy, dignified, and profitable mode of life? Of course, it is open to the Progressive Party to insert a "plank" in their "platform" respecting the payment of Members of Parliament, and of every other public body, out of the rates and taxes, in order that England may participate with the United States in all the blessings that flow from the endowment of politics as a profession; but, in the meantime, where is the virtuous demagogue to look for his wages? We notice that the working men of London, although accustomed to cheer the great and glorious John Burns to the echo, are by no means free with their coppers for his support. It has recently transpired that John Burns has hitherto been paid his regular wages of £2 per week, and allowances, of which £1 per week has come from the Dockers' Union. But the funds disposable for this purpose "have shown a constant shrinkage, and the outgoings "from month to month have always exceeded the income." This is very sad. Even Battersea, which is understood to worship John Burns, will not come to his rescue in this regard; the reason assigned for this backwardness being

that in Battersea there are no large Trade Unions to which the Committee of the John Burns Wages Fund can look for help. This is as much as to say that such organizations exist for the purpose of affording support to professional agitators. We have long suspected it; but now the admission has been put upon record.

The Gasholder Patents Litigation.

Gas engineering readers of the Journal will naturally take a keen interest in the action of *Gadd v. Mayor, &c., of Manchester*, which is now occupying the attention of Mr. Justice Kekewich. We gave last week a special report of the opening of this case; and a further instalment of the proceedings will be found in another column. The action is really between Messrs. Gadd and Mason, as plaintiffs, and the well-known engineering firm of Messrs. Ashmore, Benson, Pease, and Co., Limited, as defendants; and its subject is the celebrated novel gasholder guiding without lofty external framing, for which both Messrs. Gadd and Mason and Mr. E. Lloyd Pease (of the Stockton firm) hold patents. We cannot enter at present into the merits of the case, which stands adjourned, after six days' hearing, until Tuesday, May 3, when another day or two may be expected to finish it; but we may at least indicate, in quite general terms, the nature of the issues before the Court. It will be remembered that Messrs. Gadd and Mason patented in 1887 their ingenious method of guiding gasholders from the base, by means of spiral tank-guides; and they followed this up in the succeeding year by a second patent having the same general object of dispensing with lofty guide-framing, but effecting this end without sacrificing the vertical motion of the holder. In the interval between the filing of Messrs. Gadd and Mason's second provisional specification and the deposition of their complete specification and drawings, Mr. E. Lloyd Pease obtained provisional protection for his now well-known system of rope-guiding for gasholders; and he brought this invention out (as is not disputed) without having the faintest notion that he was clashing with Messrs. Gadd and Mason. Very soon after the Pease system had been provisionally protected, the inventor's firm sought to put it in practice in the ordinary course of their business as gasholder builders; and they did so apply it to a holder belonging to the Manchester Corporation. At this time, it is important to bear in mind, for the understanding of the present case, that both patents—the second one of Messrs. Gadd and Mason, and the only one of Mr. Pease—existed merely in the provisional protection stage. According to the evidence, there were no means open whereby anybody could have discovered the character of Messrs. Gadd and Mason's intentions; but there was at least a possibility, in connection with the Manchester gasholder contract and otherwise, of other people learning the nature of Mr. Pease's plan. When the complete specification and drawings of Messrs. Gadd and Mason's patent appeared, however, they contained mention of ropes for gasholder guiding, to which purpose Mr. Pease had also applied them—to wit, in the Manchester example already referred to. In these circumstances, Messrs. Gadd and Mason took the view that this Manchester application was an infringement of their patent, which ante-dates that of Mr. Pease; and consequently they took these proceedings against the Manchester Corporation—practically, against Mr. Pease's firm, who have been under the usual necessity of indemnifying their customers against risks of this kind. The course of the Chancery proceedings thus initiated by Messrs. Gadd and Mason has run upon the lines of the setting up, by the plaintiffs, of their patent as being a good one; while the defendants plead that the patent is bad on account of disconformity and anticipation, in the usual style. How these various pleas are being supported must be ascertained from the reports. We shall content ourselves for the present with remarking that a technical museum would benefit greatly by receiving from the parties a present of the elaborate models and other exhibits used to demonstrate the nature of the issue before the Court. We had occasion last week to refer to the litigation respecting the Lane-Fox electrical distribution patent; and it is a noticeable coincidence that the arbitrament of the Chancery Division of the High Court of Justice should be sought, at practically the same time, by litigants so conspicuously representing the two chief branches of the industry of artificial lighting. The same leading Counsel have been engaged in both actions; and they have shown themselves equally familiar with the refinements of electrical science and gasholder construction. The technical teaching imparted through the agency of the Superior Courts of Law is doubtless the best that can be had; but the worst of it is that it is horribly dear. We shall have more to say upon this subject on a future occasion.

The Rating of Machinery.

That hardy parliamentary "annual," the Rating of Machinery Bill, has again been read a second time in the House of Commons, and duly referred to a Committee, from whose care it will be marvellous if it emerges in time and fit condition to become law. A good deal of assertion and counter-assertion is always made about the scope and object of this measure whenever it comes up for public discussion. The fact that it is called in some quarters the "Manufacturers' Relief Bill," is an indication of the *animus* which it has excited in the minds of representatives of other interests; but there is doubtless much to be said for as well as against it. Seeing that gas-works machinery is exempted from the scope of the Bill, our direct interest in it is small. Indeed, it is the piecemeal and partial character of the measure which has more than anything else prevented it from becoming law. Some people roundly contend that, under the pretence of removing some anomalies, and righting a few wrongs, it will, if passed in its present shape, create more evils and work further mischief than anything existing under the actual law of rating. That the law of rating and the practice of assessment need reforming, nobody who knows what is done under these names will deny. But confusion would be worse confounded by the passing of any Act to discriminate, in the matter of rating, between machinery employed in some kinds of factories, and similar machinery used for other purposes. Let the law of rating be amended, by all means; but let it be done in accordance with some intelligible and universally applicable principle, if this can be ascertained. We are all interested in the improvement of the law of rating, and the cheapening of the process of arriving at fair assessments in cases of dispute; but if we are not all to be treated on the same footing in this regard, things had better remain as they are.

Municipalism in Action.

The judgment of Mr. Justice Collins, in the action that was brought last year by the outlying Local Boards served with gas by the Oldham Corporation, to compel the Corporation to bring into their accounts the value of the gas used for lighting the public streets within the borough, was taken into the Court of Appeal last week, with the result that the learned Judge's decision was upheld. Looked at in one way, the question in dispute is of very narrow local interest. It can hardly matter very greatly to the outside world whether certain localities in the neighbourhood of Oldham pay 1d. more or less per 1000 cubic feet for the gas which they draw from the central gas-works of their district; but there nevertheless is a point of general interest in this particular Oldham question, which should keep it from being overlooked by students of the higher politics of gas-works administration. In fact, Oldham is a potent example, in more than one respect, of the results of municipalized gas supply. For many years the Corporation Gas Committee treated their outlying consumers in the most high-handed manner conceivable of any gas company of ante-sliding-scale days. In the fulness of time, however, these latter had full and complete revenge, when Parliament did something to bring the Gas Committee to their bearings. Thereupon the Committee found a way to baulk the outsiders of some of the benefit which they had hoped to gain from the action of Parliament, by taking advantage of a sanction undoubtedly existing in an old statute. Herein lies the interest of their proceedings. We may see, by this example, that there is no morality about municipalized gas supply. It is idle to say of a corporation gas committee that this or that ought or ought not to be done. Such language is wholly beside the question; which is only as to what is profitable, and permitted. As we said last week with reference to Salford, anybody who may be disposed to think that gas supply by municipalities cannot give offence, should be recommended to quit the dreamland of the Socialist, and open his eyes to

the facts. Again, every local opponent of a municipality should take warning by Oldham, and see to it, at the proper time, that there are no old statutory sanctions in the background which can be put in operation to defeat later parliamentary intentions. It may well be a question whether some limitation should not be imposed upon the revival of musty statutes under new conditions; but, in the meantime, whenever there is a parliamentary fight over a Municipal Gas Bill, it should be a *sine quâ non* that every anterior statutory provision should be paraded for review, and, if necessary, for amendment or repeal. In these matters, there is no falling back upon the common law of the land. Gas supply is an affair of statute law; and where any statutory sanction exists, it is idle to raise the question of right or wrong. Instances like this of Oldham might be supposed to daunt some of our modern "cock-sure" politicians of the study, who prate so glibly of the advantages to be derived from "municipalizing" everything, but for the embarrassing circumstance that these people have a truly Jacobinical trick of ignoring facts which disagree with their pet theories.

A Parisian Story.

THERE are a good many "morals" in the curious and improving story that reaches us from Paris concerning the application to the Municipal Council, in the name of an Electric Lighting Committee, for a vote of 40,000 frs. to defray the increased cost of coke over coal in the case of the Halles central station. It appears that some few months ago the Municipality was suddenly seized with a desire to mitigate the smoke nuisance in Paris, which, to quote a classical description perfectly applicable in the circumstances, "has increased, is increasing, and ought "to be diminished." It was, however, pointed out that the Municipality's own chimney, attached to the Halles electric light station, was one of the worst offenders in all Paris; and that, pending the discovery of a perfect smoke-prevention apparatus capable of dealing with the inferior French coal patronized by this intensely patriotic authority, only the use of the coke sold at a very respectable figure by the Paris Gas Company would enable the Municipality to embark upon its new crusade with clean hands. It is not likely that the Company, which is conspicuously French in every one of its dealings, would sell coke for such a purpose at a centime below the highest price that could be screwed out of the Municipal Electric Lighting Committee; but, at any rate, it turned out that the cost of coke-firing in this instance was so much in excess of that of the coal formerly used, that a grant in aid had to be asked for. As the mouthpiece of the Electric Lighting Committee politely put it to the Municipal Council, "the officials were not to be blamed for "having conformed to a vote of the Municipality, "but the Committee nevertheless felt obliged to re-"mark that the cost of production of the electrical "unit was thereby increased." How instructive it would be if all smoke-abatement enthusiasts inclined to use coercion for carrying their point, were similarly led to first try putting their own house in order! But there is one point about this story which seems to require further elucidation. We cannot understand how, at the ordinary comparative values of coal and coke, the latter should work out to be more expensive for steam raising than the former. In most English towns away from the coal-fields, it would be quite the reverse. It may in all probability be assumed, without much error, that in Paris the comparison is that between bad coal and good coke; the latter, moreover, being so much in demand for household purposes, that it comes expensive for any uses to which the former is applicable. Again, the boilers may not be very good steam raisers. As we have already remarked, however, this Parisian story is full of morals for several orders of readers.

The Forthcoming Meeting of The Gas Institute.—Mr. W. H. Harvey, Secretary of The Gas Institute, desires us to remind members of the Institute of the contents of the circular they have received referring to the forthcoming meeting, to be held at the Institution of Civil Engineers, Great George Street, on June 14 and two following days. The Council hope that the intimations contained in this circular, especially with regard to the supply of papers, contributions to the Institute Library, and subscriptions to the Benevolent Fund, will not be overlooked by those to whom it was addressed, and that the members generally will co-operate to ensure a thoroughly satisfactory and successful gathering.

WATER AND SANITARY AFFAIRS.

THE London Water Bill, brought into existence by the ingenuity of the County Council in conjunction with the Corporation, has passed its second reading in an altered form, and under circumstances in many respects peculiar. As originally framed, the Bill was at singular variance with the request urged more than once upon Lord Salisbury by the County Council, that the Government would undertake a complete inquiry into the Metropolitan Water Question, and so relieve the Council of a task for which it felt itself unequal, although designated to its performance by Sir Matthew White Ridley's Committee. The Government not moving fast enough to please the County Council, that body, in the course of last autumn, initiated a Bill conferring certain powers upon itself to conduct an inquiry, and for this measure it obtained the countenance and pecuniary aid of the Corporation. In the middle of January, the Government announced that a Royal Commission would be appointed to deal with the subject; thus entirely changing the situation. The complete withdrawal of the Bill might have been thought the most reasonable course, under this altered condition of things. But, strange to say, it now appears that the President of the Local Government Board recently came to the rescue, and entered into conference with the County Council and the Corporation for the purpose of modifying the Bill, so that it might not be altogether extinguished. The power to make a public inquiry has been struck out, and other clauses either eliminated or altered. The scheme for a Joint Committee of the Council and the Corporation is retained; such Committee being authorized to make any private inquiry relative to the water supply, and to enter into negotiations with the Water Companies. Mr. Ritchie has also consented that the County Council shall have power to introduce Water Bills, the cost to be defrayed out of the rates. In this form the measure has so far received the approval of the House of Commons. It can scarcely be said that the Bill was debated when the second reading was agreed to last week; the speakers being Sir J. Lubbock, who had charge of the measure, and Mr. Ritchie, who approved of it as amended in accordance with his suggestions, followed by Colonel Makins, who was apparently disposed to make the best of a bad bargain, and Mr. Stuart, who took up the cudgels for Sir Thomas Farrer, who had been censured by Colonel Makins for rejoicing over the recent fall in the market value of the Companies' shares, which fall, we may observe, is now being rapidly retrieved. Colonel Makins had some misgiving that the County Council would introduce a Bill for a competing supply; and he was anxious that a clause should be introduced making it clear that no such power was conferred. Mr. Ritchie expressed the idea that it was very unlikely the County Council would think it desirable to introduce a Bill dealing with the Metropolitan Water Question until the Royal Commission had reported. In what light the report of the Commission will place the question of a competing supply is, of course, somewhat conjectural. But that the County Council has a fixed idea for the introduction of a fresh supply, is rendered perfectly clear by the remarks of Sir J. Lubbock, as well as by the general tenor of the arguments used in the County Council from time to time on this subject. All this does not literally mean that the new supply should be competitive; but it is important to observe that Sir J. Lubbock's speech in the House was distinctly founded on the notion that a distant source would have to be sought. He disputed the assertion that the chalk formation would yield the quantity required, and quoted the Duke of Richmond's Commission in support of that denial, regardless of the fact that the Rivers' Pollution Commission had subsequently placed reliance on a supply from the chalk. The Bill, as it now stands, is styled a "preliminary" measure. We look upon it as an unnecessary one, and of a nature to complicate the state of affairs at the date when the report of the Royal Commission makes its appearance. The best we can hope for is that Parliament will yet lay the Bill aside, as something coming before its time. The Water Companies have petitioned to be heard against it; and they are perfectly justified in doing so.

The comprehensive speech delivered by Mr. George Banbury, who occupied the chair at the half-yearly meeting of the East London Water Company last week, affords a vivid review of the situation in which the London

Water Companies find themselves placed at the present time. The position, although critical, is not to be called alarming; and the Chairman very properly reminded the meeting that every water undertaking which had hitherto been acquired by a public authority had been purchased upon a fair and just basis—a course which had also been recommended last year by Sir Matthew White Ridley's Committee in reference to the London Water Companies. Mr. F. Tendron, in a speech which followed that from the chair, displayed a very natural degree of indignation at the manner in which Sir T. Farrer had congratulated the County Council on last month's drop in the market value of the Water Companies' shares. But even Mr. Tendron was without fear for the future; having confidence that Parliament had sufficient respect for the legal rights of property, to secure for every shareholder an income equal to that which he was already enjoying. While agreeing with Mr. Tendron that such is the result to be expected at the hands of Parliament, we have no belief that the County Council will propose anything so equitable. Sir T. Farrer's letter in yesterday's *Times* sufficiently shows this. It is the composition given to the Council by the late election by the ratepayers which excites apprehension among the holders of water stock. But Parliament is greater than the Council, and unless the forthcoming general election for the United Kingdom introduces a new and dangerous element into the Legislature, the shareholders in the London Water Companies may rely on being dealt with fairly, when the terms of purchase come to be finally settled. Mr. Rokeby Price, who also addressed the East London meeting, was as strenuous as Mr. Tendron in denouncing the remarks made by Sir T. Farrer. But the Chairman shrewdly observed that parties wishing to buy water stock would probably find they had to pay considerably more than the price which had been lately quoted. Respecting the Royal Commission, the Chairman rightly expressed his confidence; the Companies now having the chance of presenting their case before "a competent and impartial tri-"bunal." A fair hit was made, when the Chairman referred to the introduction of the London Water Bill, in the teeth of the decision arrived at last year by the Select Committee, and accepted by the House. Mr. Ritchie has now paid such court to the County Council as to permit this Bill to proceed; thereby putting the Water Companies to the expense of fighting their case while a Royal Commission is about to deal with the whole question. But the eve of a general election has a peculiar influence on statesmen, and may account for the special tenderness with which the London Water Bill has been treated, especially as the Corporation are connected with the scheme. Apart from the main question, the internal affairs of the East London Company present many features of interest, including the abandonment of the Old Ford station, and the concentration of the works at Lea Bridge. Other items of progress, possessing considerable magnitude, include the large addition about to be made to the already extensive reservoirs at Walthamstow, where also a new pumping-engine is to be erected. It is an important fact that the wells are found to yield a supply exceeding that which has been calculated upon. This, again, is a matter which bears upon the broad question whether existing sources are sufficient to meet future demands—a subject which will require the most careful and unbiassed consideration on the part of the Royal Commission.

Presentation to Mr. W. Blackledge.—The occasion of the retirement of Mr. William Blackledge, from the management of the Chorley Corporation Gas-Works, after having filled the position for 35 years, was chosen by the employees to offer him a slight memento of their association together, and of their respect and esteem for him. It took the form of a testimonial comprising a walking stick and an umbrella, a photographic group of the officials and workmen, and a spirit case. These were presented to Mr. Blackledge at a complimentary dinner given to him on the 2nd inst., when the Chairman of the Gas Committee (Mr. Kirkman) presided, and referred to the efforts Mr. Blackledge had always made to do his best for those under his orders and also for the Corporation. In accepting the gifts, Mr. Blackledge thanked the workmen for the great readiness they had displayed to help him in times of difficulty. He was retiring owing to physical weakness, and his work would, in future, be done by someone who was younger and more energetic. He asked for his successor the same hearty co-operation he had himself received, so that the highest results might be obtained for the town.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 678.)

LAST week everything was in favour of improving prices in the Stock Markets. The cheapening of money culminated (as was generally foreseen) in the reduction of the Bank rate of discount on Thursday to 2½ per cent. from the 3 per cent. figure at which it had remained since the 21st of January. Then the fine weather and the generally peaceful prospects abroad and at home had their influence; and, but for the continuance of the lamentable coal strike, the week might be said to have been almost without a cloud. But for all that, business still remains restricted below what one would naturally expect; and when there had been a perceptible rise in prices, they received a check from the resulting move to realize profits. Things may be expected to rule very quiet until after Easter. The Gas Market has been much more active; and the tendency almost throughout was favourable to advancing prices in a moderate degree. Gaslights were freely dealt in. The "A" was very steady, at about 214-216; the best mark being one transaction at 216½. The debenture issues were firm and unchanged. The preferences were rather better—"C," "D," and "E" advancing 1; and "K," ½. The limited "H" made the best advance, of 2½. There was not much done in South Metropolitans; but prices were good. The "A" rose 1; and the debenture, 2. Commercial furnished the only instance of flatness; the old stock falling 2. Why this should be, while the new remains firm, is not apparent. The Suburban and Provincial Companies continue almost inanimate—scarcely a transaction being marked in them; and the only alteration in the quotation is a rise of 2 in Brentford new. The Foreign undertakings are also remarkably quiet. European was about the most active, and at firm prices; while Imperial Continental effected a rise of 1—the only change throughout the list. The Water Companies have been much more active, and the recovery in values is proceeding. Chelsea has made the extraordinary advance of 15½; showing how artificial was the previous depression. It would puzzle most people to say why £100 of its stock should be worth £15 more on Saturday than on Monday.

The daily operations were: The Gas Market opened firm on Monday, but remained quiet all day. The movements were a rise of 2 in South Metropolitan debenture, and a corresponding fall in Commercial old. Water remained stagnant. Quietude still prevailed on Tuesday in Gas; and the only feature was an advance of 2 in Brentford new. Water began to rise; Chelsea marking 5 higher. Wednesday was a busier day, dealingsbeing mostly in Gaslight "A" and European; but quotations did not move. Chelsea water rose another 5; and East London, 1. The activity of Gaslight "A" was maintained on Thursday, and the secured issues also attracted notice—making the advances noted above. Southwark water rose 1. Friday was somewhat quieter; and the only move was a rise of 1 in Imperial Continental. The progress in Water was an advance of 2½ in Chelsea, 1½ in East London, 1 in Grand Junction and Southwark, and ½ in Lambeth. Saturday was a very inactive day; but the tendency was favourable, and South Metropolitan "A" rose 1. Chelsea Water improved 3; Lambeth, 2; East London, 1½; and West Middlesex, 1.

ELECTRIC LIGHTING MEMORANDA.

The Affairs of the London Electric Supply Corporation—An Easy Comparison—The Weakness of the Crystal Palace Exhibition.

THE recent ordinary general meeting of the London Electric Supply Corporation was looked forward to with much curiosity. The report and accounts issued by the Directors upon the past year's operations were anything but cheerful reading for those who had put their money into the concern. Upwards of three-quarters of a million sterling has been spent upon this gigantic experiment. The Deptford Station stands the Company in £280,000; and the mains have cost £148,000. The sales of current by meter at 7¼d. per Board of Trade unit realized £13,783; and, taking all the working expenses into account, every unit which was sold for 7¼d. cost the vendors nearly 1s. This is the comment of the *Electrician* upon the Company's transactions. It is shown that while the current generated at Deptford cost 5¼d. per unit, distribution and management added 6¾d. per unit to the cost. Of course, the latter is an entry that can be reduced with increase of business; and it must not be forgotten that the unfortunate fire at the Grosvenor Gallery station was the occasion of great loss of custom to the Company. In addition to this, however, there appear to be several things wrong about the Company's plant. Altogether, a more gloomy prospect than that lying before the ordinary shareholders of the London Electric Supply Corporation can hardly be imagined, bearing in mind the fact that the concern is not, like many of the early electric light companies, a patent swindle. In Mr. J. S. Forbes, however, the Corporation have a Chairman who admits that he is more at home when making the best of a bad business than when recommending the declaration of a good dividend. Mr. Forbes does not despair of the undertaking, but confesses that it is in such straits that it must be mortgaged for £50,000 in order to procure money to carry on the business. The courage that has been so marked a characteristic of this Board

does not desert them now. They believe their principle of supply is right, and they accordingly mean to "stick to the thing, and perfect it up to 90,000 lamps," as the Chairman put it. This is a spirit deserving success, even if it fails to command it.

Municipalities and others interested in the comparison of the two leading methods of distributing electricity for lighting purposes—the high-pressure alternating and low-pressure direct systems—cannot fail to learn a good deal by comparative study of the accounts and circumstances of the various London central station companies. The undertaking dealt with in the preceding paragraph—the London Electric Supply Corporation—are in low water just now; but this is not so much on account of anything really defective in their system, as because circumstances have hindered the commercial extension of their business. One striking feature of the situation of this Company is the comparatively small amount at which their mains stand in their books, which is due, of course, to the nature of the system of distribution. Another Company whose affairs have just been explained to the shareholders is the Notting Hill venture, working with the low-pressure system, with accumulators, and charging in their good residential district 8d. per Board of Trade unit, or ¾d. per unit more than the Deptford Company. Now the Notting Hill Company, although they have had no accident to check their development, are not in a very much better way than the unfortunate London Electric Supply Corporation. It is to be noted that of the total capital expenditure of £67,845 for the Notting Hill district, no less a sum than £26,794 has gone for mains. The generating machinery has meanwhile cost only £7965, to which must be added £4892 for batteries and copper connections at the generating stations. Thus it will be seen that a small copper-mine has already been put into the subsoil of the streets of this corner of London, awaiting business which is painfully slow to come. The streets that are actually wired contain nearly 800 houses, for the most part of very good class; and of these only 77 had been serviced up to the end of the year. In the circumstances, it is not surprising to learn that the Directors decline to draw their fees until the fortunes of the undertaking shall have improved. What we desire to point out in connection with these facts is the clear conclusion that profitable electric lighting is a commercial rather than a technical problem.

We are not singular in regretting that so little real service in the cause of the technology of electric lighting is being done by the Crystal Palace Exhibition. Our contemporary, the *Electrician*, claims to have suggested, a long time ago, that the nomination of experts to report upon the Exhibition afforded a "splendid opportunity for doing something, but we could not say what." That is just the attitude which by this time all thoughtful spectators of the show of electrical apparatus at Sydenham have been constrained to occupy. It is quite obvious that such a collection of machinery and instruments ought to be good for something, beyond being gaped at by casual holiday makers, who would, on the whole, be better satisfied with a circus; but the fact remains that nothing is done in this matter. Our contemporary remarks that "a good suggestion or two" might have resulted in something being done to redeem the reputation of the Exhibition; but, at any rate, four or five months have passed without any such suggestions having been heard of. Now the *Electrician* hints that the various meters and measuring and testing instruments shown in the Exhibition might have been practically tried (say) in connection with the lighting of the specimen suites of apartments. It is remarked that even if this proceeding did no good, it could hardly result in making the "farce" of the show much greater than it is at present. Let it be understood that this disparaging observation is not ours, but that of an organ devoted to the electric lighting industry, which the Crystal Palace Exhibition was intended to benefit. We have already expressed, in a general way, the opinion that essentially the show is not creditable, nor likely to be helpful, to the electric lighting industry of the country; and we are glad to have this independent confirmation of our own judgment.

ROBERT HARRIS.

We deeply regret to announce the death of Mr. Robert Harris, C.E., late Distributing Engineer of The Gaslight and Coke Company, which occurred on the 5th inst. from a paralytic seizure. Mr. Harris, who was the eldest son of the late Mr. Robert Harris, of Feltham, Middlesex, was born on Sept. 14, 1835. At 15 years of age he became a pupil of Mr. Alexander Wright, who was at that time Engineer of the Western Gas Company's works at Kensal Green. During his connection with Mr. Wright, he was employed at Luton, Penzance, and other places in the country. At Christmas, 1858, Mr. Harris went to take charge, as Mr. Wright's representative, of the Great Central Gas Company's works at Bow Common; and on Mr. Wright's death in the following year, he was appointed Engineer. This post he held till the amalgamation of the Company with The Gaslight and Coke Company, the staff of which he then joined; continuing the superintendence of the Bow station, and combining other work with it, until 1884. He then left Bow, on being appointed General Distributing Engineer to the Company; and to this office he devoted himself until his resignation, on account of ill-health, in 1889. In 1860, Mr. Harris became a member of the Society of Engineers; and in 1873 he received the honour of election as a member of the Institution of Civil Engineers without going through a preliminary associateship. He was also an active member of The Gas Institute, of which he was President in the year 1884. As a gas engineer, Mr. Harris was possessed of considerable ability; and his singular simplicity of character and kindness of heart won him not only the respect, but the affection of all with whom he had to do. The funeral took place last Saturday at the Ilford Cemetery.

CONTINENTAL ELECTRIC LIGHT CENTRAL STATIONS.*

The good-looking volume which has just appeared under the above title is aimed, so to speak, at the heads of members of municipal lighting committees and other amateurs of electric lighting who desire to know, in a general way, what has been done in this line upon the Continent. It consists, for the most part, of a translation from the well-known compilation entitled "Die Versorgung von Städten mit Electrischen Strom," which was produced in connection with the Frankfort Exhibition; and as the information therein contained is inaccessible to those who do not read German, it cannot be said that Mr. Hedges has not been justified in putting it into an English dress. Whether it was quite necessary that the dress should be such an elaborate one may be a question of taste, regarding which, of course, it would be proverbially idle to dispute. It would have been better, perhaps, if the obviously second-hand character of the illustrations, some of which are hardly legible, did not contrast so strongly with Mr. Hedges's brand-new binding; but one must not be too exacting upon the self-appointed bookmakers of the electrical persuasion. It will be remembered that we recently gave a special translation of the description of the Dessau central station of the German Continental Gas Company, which was originally prepared for the publication to which Mr. Hedges is indebted for most of his matter; and we must be permitted to remark here that our edition of this particular report (see *ante*, pp. 26, 67), which possesses peculiar interest for readers of the Journal, by reason of the use made of gas-engines for driving the electrical machinery, is much fuller and better than that given by Mr. Hedges. On the other hand, the other reports translated and annotated by him never have been, and never will be, reproduced in our pages; and many of these are of importance. Among other installations, Mr. Hedges describes that of the Anglo-Romano Gas Company, who generate electricity both by water and steam power. He also cites the example of the Gas Company of Augsburg, who have a high-tension supply system worked by the power of a stream two miles from the station. The Vienna experiment of the Imperial Continental Gas Association receives due notice.

It is only fair to Mr. Hedges to say that he has not confined his work to its German prototype; but has brought in a variety of instructive matter with a view to making his book a desirable store of information upon those aspects of electric lighting which cannot be set forth at exhibitions, either at Frankfort or at Sydenham. Thus he has a short chapter on "The Distribution of Electricity compared with Gas," another on the "Load Factor," and so forth. Some of the author's observations upon the former topic are refreshingly naive. He tells his readers how "in this matter electricity is ahead of gas, in that the latter is always in the pipes, and consequently ready to escape at any minute leak, while the former does not exist in the mains until the circuit is closed." It might be thought that the same condition of being always in the pipes, or the equivalent conductors, must apply to anything distributed in either way under constant pressure; but Mr. Hedges says that electricity has an advantage in this regard, so we must believe, though at the same time confessing our inability to understand, him. He states, moreover, that "with even the very best distribution by gas, this loss [by leakage] is an unknown quantity, which in London must be very great." Strictly speaking, it is, of course, unknown how much of the very definite entry under the heading of "unaccounted-for gas" in the accounts of the London Gas Companies is actual leakage of the unpreventable kind; but it is not true that this loss is at all serious. Mr. Hedges is good enough to argue, in a special chapter, that, in towns where nobody else cares to do so, the gas company is the best hand to take up electric lighting. It is very kind of him to put it in this way; and one can easily understand that the manufacturers of electric lighting plant would as soon take orders from gas companies as from anybody else. But we fail to understand why these companies should "rush in" where electric light speculators "fear to tread." A new feature of Mr. Hedges' book is the comparative table showing at a glance the equivalent prices of electric and gas lighting; the former being due to incandescent lamps working at different rates of efficiency and at various prices of current charged by the Board of Trade unit, and the latter calculated on the assumption that a burner consuming 5 cubic feet hourly yields a light of 16-candle power. By this table it is once more established that the price of a Board of Trade unit of electricity in pence means equivalent gas at rather more than as many shillings per 1000 cubic feet. Altogether, we are able to recommend Mr. Hedges' book as containing a useful collection of data concerning the subject of electrical distribution for lighting purposes.

* "Continental Electric Light Central Stations; with Notes on the Methods in Actual Practice for Distributing Electricity in Towns." By Killingworth Hedges, M.Inst.C.E., &c. London: E. and F. N. Spon; 1892.

NOTES.

Why Water Floats in Air to Form Fogs.

It is by no means obvious why the particles of water constituting fog or cloud should float in air as they do at various temperatures. Herr von Frank, of Graz, seeks to explain the phenomenon by assuming that every such droplet is surrounded by an envelope of aqueous vapour. He gives 0·7 millimetre as the approximate average measurement of the diameter of every droplet, with its envelope. Supposing 1 cubic metre of cloud to hold 3 grammes of water, there would be an interval of 0·2 millimetre between the envelopes. It is suggested that the difficulty of understanding how water droplets, in the form of cloud or fog, can exist at different temperatures may be overcome by imagining that these vapour envelopes, being bad conductors of heat, guard the droplets to some extent from evaporating and freezing. If such minute particles of water were not in a kind of spheroidal state, they must soon be dissipated by the sun's rays, which are always shining upon the top of the fog or cloud. This solar heating expands the vapour envelopes, so that the fog always has a tendency to rise. Once more, liquid droplets have been observed by Assmann floating in air at a temperature of − 10° C. On encountering a solid body, these drops froze into lumps of ice without crystalline structure. Here, according to Herr von Frank, we can see the vapour envelopes preventing freezing of the floating drops of water until they are broken up by the solid. Then the water having lost its non-conducting coat, freezes so quickly that there is no time for the formation of crystals. Herr von Frank supposes that, with much aqueous vapour in the air, larger drops form—the clouds floating lower. With less aqueous vapour, the drops are smaller and the clouds higher; the thickness of the vapour envelope being the same for large and small drops under like conditions of temperature and pressure.

Steam-Raising by Gas and Coal.

Many attempts have been made to use coal gas for steam-boiler heating, but hitherto without success in the commercial sense. It has recently transpired that, since the natural gas of Pennsylvania and Ohio has been charged for, even at the low rate of 10 c. per 1000 cubic feet, it can no longer compare favourably with coal as a steam-raising fuel—at least in connection with the now fashionable water-tube boilers. This failure does not appear to be due to the burners, for there is very little choice in the matter of apparatus. The water-tube boiler has a large combustion chamber formed of fire-brick, which is favourable to the economical burning of gas. A boiler furnace for natural gas designed by Mr. Hartupee, of Pittsburgh, has a gas-supply pipe entering from the front, and going back to the full depth of the fire-box. From this pipe rise a number of vertical smaller pipes, which are surrounded with brickwork, only leaving a nozzle for the entry of air. The arrangement is practically that of a battery of atmospheric burners in brickwork, looking upwards into the fire-box. There does not seem to be anything to find fault with in this disposition of the gas-pipes, and yet the result is not economical. Local coal and gas being used alternately in the same boiler, it was found that, for equal periods of 11 hours' working, 24,000 cubic feet of gas were required to do the work of a ton of coal. For a day's steaming, the consumption was respectively 6·081 tons of coal, or 145,944 cubic feet of gas. At $1·40 per ton, the coal cost $8·51; while the gas at 10 c. per 1000 cubic feet would cost $14·59. To the cost of the coal, however, must be added that of labour for stoking and clinkering, which would reduce the discrepancy.

A Coffey-Still Gas-Generator.

Ceaseless effort is being made by American technicians, to improve gas-generating apparatus, mainly with a view to the solution of the question of fuel gas. A curious attempt of this kind, in which the principle of the Coffey still is applied to the gasification of coal, has been patented by Mr. Dubbs. The apparatus consists of a vertical shaft in brickwork, terminating below in a chamber for the reception of spent material, and provided at convenient intervals, in the Coffey-still manner, with overlapping inclined shelves. Immediately over the axis of this shaft is the hopper containing the supply of raw material for gas making, and also at the top a lateral extension of the shaft contains an ordinary furnace, with fire-bars, and there is also a provision for the supply of superheated steam. The object of the inventor is stated to be the production of a gas rich in combustible elements, as carbonic oxide and hydrogen, but practically free from carbonic acid. His idea is to heat up the still by passing through it in a downward direction the products of combustion of the attached furnace, and then to allow the carbonaceous materials in the hopper, with which a quantity of lime is to be mingled, to drop upon the shelves. Simultaneously therewith, steam is also to be introduced. The result expected to follow upon this proceeding is the separation of the steam and carbonaceous material into their constituent elements, hydrogen, oxygen, and carbon. The gases formed during the passage of the steam and carbonaceous material through the upper parts of the stack are supposed to be further acted upon in the lower portions, where the carbonic acid is to combine with the introduced lime, forming carbonate of lime, which falls ultimately into the lower chamber, whence it can be removed from time to time. The gases are meanwhile passed forward for treatment in the ordinary manner. This is one of the simplest of the new American inventions having the same object; the majority of them being elaborate combinations of pipes, retorts, and furnaces designed for the hopeless task of making cheap fuel gas by the aid of fluid hydrocarbons.

Mr. Corbet Woodall, M.Inst.C.E., has been elected a member of the Royal Institution of Great Britain.

Institution of Civil Engineers.—At the meeting of this Institution last Tuesday, the monthly ballot resulted in the election of five members and thirty associate members. Among the latter were Mr. G. Lingwood, of the Barbados Water-Works; and Mr. H. O'Connor, of the Beckton works of The Gaslight and Coke Company.

A Testimonial for Mr. George Livesey.—The following appeared in the *Local Government Journal* (formerly the *Metropolitan*) last Saturday: "Mr. George Livesey is shortly to be the recipient of an illuminated address from the Camberwell Vestry, in recognition of his generous action in providing a free public library. Mr. Livesey deserves all the kind things said about him, and will unquestionably prize the testimonial as one of his most precious possessions."

The Secretaryship of the Bristol Gas Company.—Mr. John Phillips has been appointed Secretary of the Bristol Gas Company, in succession to Mr. J. V. Green, whose relinquishment of the position was mentioned in the JOURNAL last week. Mr. Phillips has been in the Company's service for upwards of thirty years, and has gained the confidence of the Directors by the way in which he has temporarily discharged the duties of the office in which he has now been permanently installed.

The Management of the Singapore Gas Company.—We learn that Mr. W. T. Batten, Assoc.M.Inst.C.E., Manager and Local Secretary of the Singapore Gas Company, has been compelled, owing to the ill-health of his family, to leave Singapore and return to England. In accepting his resignation, the Directors expressed their regret at his relinquishment of a position which he had so ably filled during the past eight years and a half. As already mentioned in the JOURNAL, Mr. Henry Willis Smith, for many years Manager and Secretary of the Caterham Gas Company, and late a Director of the Singapore Gas Company, has gone to Singapore to succeed Mr. Batten.

Professor Vivian B. Lewes, F.I.C., F.C.S., Professor of Chemistry at the Royal Naval College, Greenwich, the newly-appointed Gas Examiner for the Corporation of London, has been elected an associate member of the Institution of Naval Architects. Our readers may remember that Professor Lewes read before the Institution a paper on "The Spontaneous Combustion of Coal," and another on "Boiler Deposits;" the latter being regarded by the Council as worthy of the award of the gold medal offered by the Institution to the member who should read a paper of "exceptional merit." The decision of the Council was made known to the general body of members at their annual meeting last Wednesday.

North British Association of Gas Managers.—We have received from the Secretary of the above Association (Mr. R. S. Carlow, of Arbroath) a copy of the report of the proceedings on the occasion of the thirtieth annual meeting, held in Edinburgh in July last, under the presidency of Mr. R. Robertson, of Bathgate. The papers read by Mr. West, Mr. Love, and Mr. Macfie are illustrated by folding plates; and the technical matter is followed by the Rules of the Association, list of members, &c. Incorporated in the pamphlet is the "Statistical Report of the Gas Supply of Scotland" for the year ending Aug. 1, 1891, prepared under the supervision of the Committee of the Association. These returns were formerly issued separately.

Mr. W. Oldfield, Manager of the North Bierley Gas Company, having obtained a similar appointment under the Goole Gas and Water Company, was entertained to dinner at the County Restaurant, Bradford, last Friday evening. Mr. W. Wood, Engineer-in-Chief of the Bradford Corporation Gas Department, presided; the vice-chair being occupied by Mr. J. Niven, Manager of the Clayton, Allerton, and Thornton Gas Company. In proposing the toast of the evening, the Chairman referred to the excellent work Mr. Oldfield had carried out in connection with the enlargement and remodelling of his works. Mr. Oldfield acknowledged in feeling terms the appreciative remarks made by the various speakers; and the remainder of the evening was devoted to a discussion on technical matters affecting the gas industry.

Death of Mr. George Shepard Page.—We regret to announce the sudden death, on the 26th of March, of Mr. George Shepard Page, of New York, the well-known American financier. Mr. Page was engaged in many branches of industrial finance; but his name was most familiar to readers of the JOURNAL in both hemispheres through his connection with the St. Louis and other American Gas Companies, and his efforts to interest English capitalists in the gas industry of the United States. His figure was at one time almost as well known, and quite as welcome, at the meetings of The Gas Institute (to which he was in 1888 elected an associate) as it was at the gatherings of similar organizations in the United States. Mr. Page was about 50 years of age, and was born in Maine. He died at Morris Plains, of pariesis, following upon influenza.

TECHNICAL RECORD.

NEW ENGLAND ASSOCIATION OF GAS MANAGERS.

The Annual Meeting at Boston.

(*Concluded from p.* 620.)

After the discussion on Mr. M'Kay's paper on "A Gas-Works as a Heat-Engine," two papers having reference to the use of oxide of iron for purification occupied the attention of the meeting. The first was by Mr. W. A. Wood, of Boston, and comprised a description of a modification of the apparatus described before the Association by Mr. W. A. Learned, two years ago, for revivifying oxide by drawing air through it *in situ*. Mr. Wood's apparatus consists of a steam-jet exhauster, which can be fixed to the inlet or outlet of the purifier, so that, when the cover is raised, air is aspirated downwards through the material, and discharged at the outlet of the exhauster, from which a perpendicular pipe extends through the roof of the purifier-house. Mr. Wood has pipes fixed permanently over each purifier; and the exhauster, with a few feet of pipe, forms a moveable connection between the outlet of the vessel and the lower end of the pipe. He said he was applying this system to a set of eight boxes, each 24 ft. by 30 ft.; and as he made his own oxide at a cost of from 6d. to 7d. per bushel, and was able to purify from 90,000 to 120,000 cubic feet of gas with this quantity, his purification cost him next to nothing. The second paper was read by Mr. Z. M. Jenks, of Woonsocket (R.I.), and referred to the use of oxide for purifying water gas. The generating plant consists of a double set of the Grainger-Collins type. After passing the scrubbers and condensers, the gas enters a relief holder, from which it goes through a second set of condensers to the purifiers. These consist of four boxes, each 10 feet by 16 feet, with centre-valve and 10-inch connections. The material used consisted of the following ingredients: Sawdust, 20 bushels; lime, 10 bushels; Prince's paint, 8 bushels; and copperas in solution, 300 lbs. This was gradually brought into use to the complete exclusion of lime, with satisfactory results, and no diminution in the illuminating power of the gas. After two or three years' revivification in the usual way, he decided to try a plan similar to that described in the paper just read. The only difficulty he found was that the revivified material, when brought into action again, reduced the illuminating power for several hours. To meet this, he passed a few thousand cubic feet of gas through the clean box at intervals, before bringing it again into use.

On the subject being submitted for discussion, Mr. S. F. Hayward asked if Mr. Wood found any offensive odours caused by his process. He believed that at New York a somewhat similar plan was tried, but that the outlet-pipe was conveyed to the boiler-flue. Mr. Learned found that the process could not be used without some odours escaping; and he quite agreed that, in a thickly-populated neighbourhood, it would be necessary to connect the outlet to a flue. He worked with a pressure of 6 or 7 lbs. of steam, producing 0·5 inch exhaust in the purifier; and he found he was able to do the work more effectually, and within six hours. Mr. Sherman had tried the plan of revivifying *in situ*, but had to give it up on account of complaints of nuisance. Mr. Gifford asked for information as to the best kind of sawdust to use. He said a lot of oxide mixed with pine sawdust worked satisfactorily; but it was rather inclined to fire. Some made up with mixed sawdust, including all sorts of wood, did not appear to recover its colour so well. He thought this might be due to the presence of traces of gallic acid in the wood. The President remarked that he had found a difficulty in getting sawdust sufficiently coarse. The best he could procure came from Maine; and it was delivered in a compressed condition, which brought the carriage down to a low figure. He understood it was pinewood sawdust. Mr. Bush raised the question of mixing lime with the oxide. He thought that it would be left in the mixture in a foul state after the first time of using; and this would prejudice the utility of the material. Mr. Goodno said this was a mistake. When copperas was added, the lime was fixed as sulphate of lime, and remained unchanged. Mr. Isbell used the process mentioned by Mr. Wood, having a steam-jet exhauster and connections to each purifier, so that the lid could be raised and air drawn downwards through the material. Sometimes he connected the outlet from the exhauster to a chimney; but he had treated the air effectually by passing it first through a water scrubber, and then through a lime-box. After this it could be discharged without fear into the open air.

Mr. Wood, replying to questions, said that after about half-a-dozen revivifications, it was necessary to break up the material, as it was liable to cake. He wished to impress upon the meeting the fact that the process could not be expected to answer without careful supervision. The kind of sawdust had some effect in regard to liability to fire. He always used cast-iron borings for making the oxide. There was no nuisance caused from the outlet-pipe. At first starting, there was a little indication of sulphuretted hydrogen; but after a few minutes, this quite ceased. He had tested the blast with lead paper. With respect to heating, the man in charge thrust his hand and arm into the material from time to time, and in this way judged if it was getting too hot. A spray of water was spread over the material from time to time during revivification; and he liked to add as much as could be absorbed. He preferred to pass the air more slowly than Mr. Learned; and he usually had an exhaust of $\frac{1}{8}$ inch—never more than $\frac{1}{4}$ inch. With regard to cost, he might say that, including everything but the steam, it did not exceed $\frac{1}{4}$d. per 1000 cubic feet. He did not like the plan of drawing in air with the gas, though it had proved very useful on an emergency; and something like 1 per cent. of air had enabled him to run his purifiers for a considerable time. Mr. Jenks thought there was no special advantage in employing lime. It was useful in a mechanical sense, as it lightened the material. Other things might do just as well. The mixture he used was thoroughly efficient; and the difficulty to which he had alluded in his paper was the only one that occurred with it. He thought it arose from the fact that the material was revivified to a greater extent than was the case in the usual way.

Mr. F. C. Sherman, of New Haven (Conn.), followed with a paper describing results obtained with deep furnaces. He said that some seven years ago he prepared plans and estimates for a retort-house with full-depth regenerator furnaces. But he found that, though the theory was correct, several difficulties arose in practice; and those who were using the system were not altogether satisfied with it. A serious objection in the case of small works was the fact that it called for more intelligence and care than could be expected from an ordinary stoker. In the present state of the labour market, any advantage gained in one way would be lost in another; and if more coke was saved, there was the question of finding a market. In his own case, he could only realize about 12s. 6d. per ton for it. For these reasons, together with the heavy cost of the stage floors and regenerative furnaces, he preferred to put in deep furnaces instead. His works were only about 6 feet above the water-line; and therefore he could only get a depth of 4 feet above the grate-bars, though he would have liked 5 or 6 feet. The arches were 8 feet wide, and measured 13 feet from the ash-pan to the crown; and the furnaces were 5 feet 3 in. long by 16 inches wide, with openings at the top for admitting air. There were six retorts, each 15 in. by 30 in., and 9 ft. 8 in. long, in a bed. After upwards of a year's working, he had averaged 10,700 cubic feet per ton of Westmoreland coal, with a consumption of one-third of the coke. All that was required was a sufficient depth of fuel and a proper regulation of air. He introduced steam below the grate-bars.

Mr. Stiness commenced the discussion on Mr. Sherman's paper by remarking that, after ten years' experience with the Dieterich full-depth regenerator furnace, he could not agree that additional skill or intelligence was called for on the part of the stoker. He preferred to work on the ground floor, with a basement for the furnaces, rather than to lift all the coal to a stage floor. Mr. Harbison had a stack of Stedman-Stanley furnaces, and agreed that no additional expense for labour was necessary. The same men who worked the old furnaces could work the new ones. But he preferred a stage floor, with the cellar at the floor-level, as the men ought to have fresh air. Coke was worth much more than the figure named in the paper for water gas. Mr. W. A. Wood was surprised to hear that a higher class of labour was required for the full-depth regenerator furnace. After having had experience with all kinds, he found that men who could work one could work another. Mr. Nettleton thought it was best to adopt the most advanced apparatus, even in small works; and he said this after personal experience. Mr. Sherman, in reply, claimed that the Dieterich was a generator furnace only. With every change of wind, the draught and dampers of a full-depth regenerative furnace required regulation; and he considered that a fireman of more than ordinary intelligence was indispensable for successful working. The saving in first cost afforded by his arrangement had been overlooked.

This completed the business; and the meeting then closed with the usual votes of thanks.

STOKES AND ARMSTRONG ON FLAMES.

Referring to the recent papers of Professor Smithells and Mr. Ingle and of Professor Vivian B. Lewes upon "Flames" (see *ante*, pp. 68, 338), some correspondence between Sir G. G. Stokes, Bart., F.R.S., and Professor Armstrong, relating to the same interesting subject, has been laid before the Chemical Society, and published in full in the *Chemical News*.

Sir. G. Stokes's first letter refers to his optical proof of the existence of solid particles in flames, reference to which was made in the JOURNAL for Dec. 29 last year (p. 1178), which he describes as using a flame as a screen on which to receive an image of the sun. He remarks on the existence of a "lot of compounds" in the interior of the flame. Professor Armstrong, in an address to the Junior Engineering Society, had spoken of oxygen combining with hydrogen in preference to carbon. Sir G. Stokes remarks that he should have supposed it would have been the other way, because steam is decomposed with facility by glowing carbon; and the idea seems to fit in with the phenomena of flames. Sir G. Stokes points out the importance of carefully distinguishing between the changes which take place in the partial combustion of a molecule and those which are produced in neighbouring molecules as a result of the heat thus produced. He calls the former "pure-chemical," and the latter "thermo-chemical;" and he thinks that in the blue base

of the flame of a candle, where oxygen is plentiful, there are pure chemical changes. The blue shell invests for a little way the highly luminous shell, like a calyx investing a corolla; and it is suggested that the thin shell of glowing carbon to which the bulk of the light is due, owes its origin to a thermo-chemical change—the heat being derived from the combinations with oxygen which take place just outside it.

Sir G. Stokes suggests that the hydrocarbon spectrum is due to a gas formed by a pure-chemical, as distinguished from a thermo-chemical change. This gas is commonly supposed to be acetylene; but to Sir G. Stokes it seems more likely to be marsh gas. According to him, this doubtful gas is a hydrocarbon requiring the presence of other hydrocarbons to show the hydrocarbon spectrum. At any rate, Sir G. Stokes suggests that the gas must be something of a simple kind, formed in the process of partial combustion, though probably, under ordinary conditions, itself burnt almost immediately afterwards. The date of this letter is Sept. 23, 1891. In his reply on Jan. 18 last, Professor Armstrong refers to the interim appearance of Professor Smithells's papers, which he says exhibit conclusions practically identical with those arrived at by Sir G. Stokes. He explains that he was led to think the hydrogen was the more combustible constituent of a hydrocarbon by the circumstance that a gas such as methane yields acetylene as one of the products of its incomplete combustion. It is possible, he admits, that this production may be due to the agency of heat alone; but he inclines to the alternative view that it is due to partial removal of the hydrogen from the methane by oxygen. At any rate, Dr. Miller and Professor Armstrong were unable to detect acetylene in oil gas manufactured by passing petroleum hydrocarbons through highly-heated retorts.

Professor Armstrong admits that we know less about the phenomena of combustion than was deemed to be certain a few years ago; but he declines to agree with Sir G. Stokes and Professor Smithells that the carbon is the more combustible component of a hydrocarbon. He does not consider the difference between Sir G. Stokes's pure-chemical and thermo-chemical actions to be important in practice; and he thinks that there is very little opportunity in flames for simple heat-changes to occur—the molecules of different kinds being so mixed up together. He doubts whether, under the conditions prevailing in flames, carbon is ever separated by simple heat-changes. At all events, there is no present evidence to this effect. It is not merely a question of the relative affinities of carbon and hydrogen for oxygen, since the carbon would not be atomic carbon, but "that complex molecular form which occurs in the flame in the solid state, and, being incandescent, renders it luminous." From various other considerations—such as the superior stability at high temperatures of carbonic acid to carbonic oxide, though it is the more complex molecule; the incombustibility in oxygen of *dry* carbonic oxide and carbon; and the important influence of surfaces of various kinds (even including gaseous ones) in promoting all sorts of reversible changes—Professor Armstrong argues that it is difficult to draw conclusions in such cases. With regard to the action of surfaces, moreover, there is a quality describable as *compatibility*, which is inherent in the nature of the material composing the surface. Platinum, for example, has a strong affinity for platinum; hence the action of a platinum surface in separating hydrogen from a hydrogen compound would be different from that of copper.

Professor Armstrong remarks that this importance of surfaces in relation to the action and reaction of gases in contact with them was known to Faraday, who, in a paper dated November, 1833, says he is convinced that, "in all ordinary cases of combustion, it is evident that an action of the kind considered (of the superficies of matter), occurring upon the surface of the carbon in the fire, and also in the bright part of a flame, must have great influence over the combination there taking place." Regarding the interactions in flames as consisting in a series of simultaneous and consecutive explosions, of which we can only examine the final steady state, Professor Armstrong remarks that the phenomena must be excessively complex in character, and that it will be unwise at present to infer that the oxidation of the hydrocarbons, or the separation of carbon and also of hydrogen from them takes place entirely in any one way.

To this communication of Professor Armstrong's views, Sir G. Stokes replies by a final letter, further explaining the nature of the conceptions of the different actions which he began by describing as pure-chemical and thermo-chemical. The former he illustrates by citing the formation of water from mixed oxygen and hydrogen; and the latter by the formation of acetylene and hydrogen from marsh gas at a high temperature. In both cases the change is brought about by molecular agitation; but whereas in the one the change is propagated throughout the mass of the mixture by agitation initiated at one point, without need for continuous provocation, in the other case the change is a continuous or progressive one, depending for its gradual operation upon a constant supply of heat from without. With regard to Professor Smithells's results, Sir G. Stokes observes that they make it appear probable to him that the unknown gas mentioned in his first letter "may be carbonic oxide"—*i.e.*, no hydrocarbon at all.

The Chemistry of Gases.—Among the lectures to be delivered at the Royal Institution after Easter, will be four on the above subject, by Professor Dewar.

REGISTER OF PATENTS.

Manufacture of Gas.—Love, J., of Stratford, Essex. No. 19,888; Dec. 5, 1890.

The main object of this invention is to provide for the manufacture alternately of coal gas and carburetted water gas in retorts generally used in the manufacture of coal gas, and for the mixing of such carburetted water gas with coal gas for the purpose of raising the candle power of the latter.

In making water gas, according to the invention, the steam (preferably superheated) is passed through the coke remaining in the gas-retort after the distillation of coal for the production of coal gas has been effected therein. The coal gas is first manufactured in the retorts in the usual manner, after which the fuel or coke in each of the retorts is massed in one end, and blown into a state of incandescence by a hot blast or other current of air. The producer gas formed during this process is conducted to, and consumed in, the furnace for heating the retorts. When the fuel or coke is in a proper state of incandescence, the air blast is shut off, and highly superheated steam is admitted to the retorts at or near one end of the mass of incandescent coke, and is caused to pass through the latter, whereby it is decomposed or converted into water gas. Vaporized hydrocarbon is then admitted at or near the other end of the mass of incandescent coke, and mixed with the water gas. This carburetted water gas is then "fixed," or converted into a permanent gas in the retort, and is conveyed to the gasholder and mixed with the coal gas within; or it is conducted to a separate holder, and mixed with the coal gas in any other convenient manner. The production of water gas is continued either until the coke in the retorts is completely exhausted, or only for a sufficient length of time to cause an inappreciable deterioration in the quality thereof, leaving it still available for use as fuel. In cases where the coke is left in a highly-heated condition after the manufacture of the coal gas therefrom, the air-blast may be dispensed with, and the steam be admitted to the retort as soon as the distillation of the coal is completed.

Fig. 1.

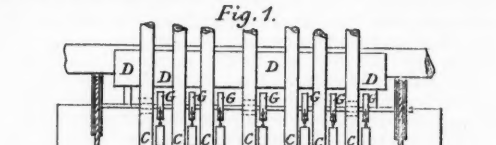
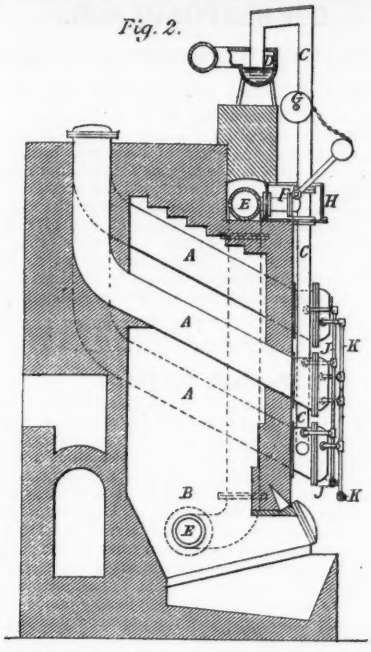


Fig. 1 is a front elevation, and fig. 2 a longitudinal central section, of a bench of gas-retorts having these improvements applied thereto.

A are the retorts; B is the furnace for heating the same; C are the pipes for conducting the gas from the retorts, which pipes dip into a hydraulic seal D in the usual manner. The retorts are set at a suitable angle, and are to be charged from their upper ends. The pipes C are connected with a pipe E communicating with the furnace B; so that, when required, the producer gas generated in the retort by the air-blast as hereinafter mentioned, may be conducted to, and be consumed in, the furnace. The pipes C and their branches are provided with suitable seatings, in combination with which is arranged a double conical valve F attached to a spindle, provided with a weighted arm or lever, so arranged that, when it is moved over in one direction, it will cause the valve F to close the gas-delivery pipe C, and, at the same time, open the branch-pipe, and, when thrown over in the reverse direction, it will open the main pipe C and close the branch-pipe. To permit the simultaneous operation of all the valves F in connection with any one bench of retorts, the weighted arms or levers are connected, by means of cords or chains, to grooved wheels or pulleys G firmly secured upon a shaft, which is supported in bearings attached to the pipes C or in any convenient manner. At either or both ends of this shaft, there is a grooved wheel or pulley, having passed around, and dependent from it, an endless chain or cord, whereby the shaft can be turned in either direction to throw the weighted arms or levers in the corresponding direction through a sufficient angle to permit their descent under the action of gravity. These chains or cords are so arranged that, when either of the weighted arms or levers is moved to the extremity of its throw or movement in one or the other direction, the corresponding cord or chain will remain slack; thus allowing the valve F to be held firmly against either seating by the action of the weighted arm or lever. In the lower part of each of the retorts, a passage or channel is formed in the side or wall, extending

Fig. 2.



for a suitable distance along it. One extremity of this passage is connected by a branch-pipe with a supply-pipe J, and the other extremity communicates with the interior of the retort. K is another supply-pipe attached to the lower ends of the retorts by branch-pipes. The pipes J K are provided with nozzles for connection with flexible pipes or hose; and the branch-pipes are provided with stopcocks or valves for regulating the supply of hydrocarbon vapour, air, and steam to the retorts as required.

The operation of the apparatus is as follows: The coal gas having been distilled from the charges in either bench of retorts, small doors provided on the retort-covers are opened to admit a rake, and the coke is thereby drawn down or massed in the lower portion of each retort. Flexible pipes or hose are then connected respectively to the pipes K J of the bench of retorts, and the valves F or cocks I are operated so as to close the pipes C running to the gasholder, and open the branch-pipes leading to the pipe E communicating with the furnace B. A blower is then put into operation, and an air-blast is thus forced through a heating coil, whence it passes into the retorts; thus blowing the mass of fuel or coke therein into a state of incandescence, and at the same time generating gas, which is conducted into the furnace B, where it is consumed, thereby greatly increasing the temperature of the retorts. When the coke is raised to a sufficiently high temperature for the manufacture of water gas, the three-way cock is turned so as to shut off the air-blast and admit steam to the heating coil; and the valves F or cocks I are again operated to close the branch-pipes and open the main pipes C. The steam, after being highly superheated in the coil, passes into the retorts, in which it is converted into water gas by its passage through and contact with the incandescent coke therein. A cock is also opened to admit the vaporized hydrocarbon to the retorts, which it enters at or near the end of the mass of fuel opposite that at which the steam is introduced. The water gas and hydrocarbon vapour are, therefore, intermingled; and the carburetted gas thus produced is fixed in its passage through the remaining portions of the retorts, which are very highly heated.

The improvements can be applied to existing gas-retorts as follows: The retort-cover is provided with a short conical pipe adapted to be closed by means of a plug of asbestos or other suitable material carried by a door formed with projections adapted to engage with lugs or hooks on the pipe, which lugs are formed with inclined surfaces, so that, by turning the door about its axis, the plug carried by the door can be forced tightly into the conical pipe. After the coal gas has been distilled, the door and its plug are to be removed, to permit the insertion of a rake for drawing the coke towards one end of the retort. To prevent the escape of gas during this operation, the rake is passed through a plug of asbestos or other suitable material also adapted to close the pipe, and carried by a door provided with projections to engage with the lugs or hooks on the pipe. A tight joint is thus formed around the stem of the rake, without interfering with its required movements. For introducing the air, steam, and hydrocarbon vapour into the retort, another plug is adapted to close the pipe; and this is carried by a door provided with projections to engage with the lugs or hooks on the main pipe, and in the door pipes are secured adapted to be connected with flexible pipes or hose for the supply of air and steam, and of hydrocarbon vapour respectively. The pipe for the supply of the hydrocarbon vapour extends to a suitable distance from the interior of the door, to ensure the introduction of the hydrocarbon vapour into the retort a short distance from the inner end of the coke therein. When the rake is removed from the retort with the main plug and door, the other plug and door together with the pipes are fitted and secured in the passage left in the mass of coke by the withdrawal of the rake through the same. After the manufacture of the water gas, the plug, door, and pipes may all be removed from the retort, and the latter be recharged with coal.

Gas and Hydrocarbon Motor Engines.—Weatherhogg, G. W., of Swinderby. No. 1447; Jan. 27, 1891.

This invention relates to motive-power engines, operated by an explosive mixture of atmospheric air or other gas capable of supporting combustion combined with the vapour of benzolene, naphtha, crude petroleum, or other hydrocarbon oils—such as the ordinary petroleum of commerce, paraffin, or coal gas. The principal features of the invention are (*a*) improved means or apparatus for vaporizing the petroleum, (*b*) improved means or apparatus for creating a Bunsen flame for heating the vaporizers and firing the combustible charge, (*c*) preventing unevaporated petroleum passing into the power cylinders, (*d*) improvements in the construction of vapour admission valves for hydrocarbon engines, (*e*) maintaining the power cylinders at uniform temperatures, (*f*) improvements in the construction of the timing or firing valves of such engines, (*g*) improvements in the construction and arrangement of the air and exhaust valves, (*h*) improved means of starting hydrocarbon engines or coal-gas motors, and an improved governor. The improvements are in part applicable to motors operated by coal gas, but mainly to those worked by petroleum or hydrocarbon vapour.

Gas-Engines.—Higginson, J., of Manchester. No. 5490; March 28, 1891.

This invention relates to the arrangement and construction of gas-engines acting in cycles, whereby an impulse is secured at every revolution of the crank-shaft.

The patentee proposes to have an engine with two pistons in line with each other connected to the same piston-rod. The front piston is placed in an open-ended cylinder, connected to a crank-pin by a suitable rod. The second or back piston works in a cylinder arranged tandem fashion with the first; and the piston moves with the front piston by the piston-rod connecting the two. The front cylinder serves as a pump for taking in and compressing the charge of inflammable mixture. The second cylinder serves as a motor cylinder. The motive impulses are applied behind the second piston; while the gases in front of the second piston are either compressed and expanded at every stroke, or alternately expelled and drawn into that end of the cylinder at each to-and-fro movement. In this arrangement, the acting sides of both pump and motive pistons are the sides farthest from the crank-shaft. Unlike most gas-engines, the motor piston terminates its stroke in the motor cylinder; leaving but a small clearance space between the piston and the back cover. At the side of the two cylinders is placed a third cylinder having ports—one opening into the pump cylinder, and one opening to the motor cylinder at or near the ends of both cylinders. This side cylinder serves to contain a piston valve or valves, by which the whole valve operations of the engine are performed. This consists of two pistons placed at a fixed distance from each other, and connected so as to move together at that fixed distance apart—the connections being preferably made exterior to the valve-cylinder. The valve-pistons are actuated from a crank-pin preferably attached to a disc on the crank-shaft; and piston-rods or trunks of reduced diameter pass and work through covers at both ends of the valve-cylinder.

Water-Meters.—Schinzel, E., of Naples. No. 9500; June 4, 1891.

This invention relates to that class of water-meters, in which the quantity of water is indicated by the number of revolutions of a fan or paddle-wheel—inferential water-meters. It consists of two principal parts (which may be detached from each other)—viz., the inner part chiefly composed of the counting mechanism and the fan or paddle-wheel, and the outer part or paddle-wheel casing. The counting mechanism is separated from the fan by a water-tight partition, on the underside of which are formed three or more (but preferably as many as six or eight) radial compartments situated above the paddle-wheel. These compartments (or the partitions between the same) are intended to oppose to the water at the upper edge of the vanes or paddles of the wheel such a resistance that it cannot flow through the meter without turning the wheel, and consequently not without being measured. To the sides of the disc are secured two posts—one serving to support the plate which contains the upper bearings of the counting mechanism, while the other post supports the lower plate, which holds the step-bearing for the fan spindle or paddle-wheel shaft. The disc containing the lower bearings for the axles of the counting mechanism carries also a cylinder or sleeve for guiding the main-shaft and keeping it water-tight. In order to ensure the smooth and easy working of the entire apparatus, the bearing-plates, as well as the tooth wheels of the counting mechanism, are made of celluloid; while the lower journal or pivot of the main shaft (preferably made of phosphor bronze) consists of ebonite or hard india-rubber running in a cup or plate of polished stone, so that the water of the latter is reduced to a minimum.

Gas-Engines.—Evans, E. W., of Philadelphia, U.S.A. No. 17,815 Oct. 17, 1891 (but date claimed under "International Convention," March 19, 1891—being that of the first foreign application).

This invention has special reference to the construction and operation of a rotary valve and a valve-jacket for gas-engines combining the principles of mixing, ignition, and exhausting; and it has for its object "cheapness and durability in construction and operation, avoiding the use of eccentrics and cams, and efficiency in timing the engine." It consists, according to the principal claim, in an engine having mixing, igniting, and exhaust ports, in combination with a jacket having a supply-port, adapted to communicate with the mixing-port in the valve at predetermined intervals; also an exhaust-port adapted to communicate with the exhaust-port in the valve at predetermined intervals. There is a receiving-chamber in open communication with the piston-chamber, and having part connections with the valve-chamber adapted to communicate with the mixing and exhaust ports of the valve at predetermined intervals; also an annular recess-port in the body of the jacket about the valve in open communication with the receiving-chamber, and provided with seats engaging the valve. The igniting-port in the valve works in alignment with this annular recess-port; and means are provided at or between the seats whereby the gas in the ignition-port may be ignited to in turn explode the main body of gas, whereby a charge of gas may be taken into the piston-chamber, &c., and in turn compressed, ignited, exploded, and exhausted, so as to impart momentum to the piston and its power-transmitting gearing.

Burners.—Gibbons, J., of Jersey City, U.S.A. No. 20,696; Nov. 21, 1891.

The burner referred to in this invention, comprises a detachable body or stem provided with lateral slotted or hook-shaped flanges and a gas-admitting nipple entering the stem, and having headed studs or pins engaged by the burner-stem flanges, and disengaged therefrom by a relative partial rotary movement; the nipple also having an outer plug or stem for connection to a gas-supply cock or pipe.

In the course of his specification, the patentee remarks that gas or vapour burners commonly used in stoves, heaters, furnaces, or elsewhere for cooking and heating purposes, give considerable annoyance in use by choking up at their gas and air inlets or passages, and at the flame cap or tip, by both sooty deposits given off from the fuel they burn, and dusty or greasy particles which accumulate about the parts, and which become hard-baked upon the screw or bolt fastenings usually employed to hold the flame-cap or tip to the burner-stem or mixing-tube. When these screw or bolt fastenings "burn in," it is very difficult and often impossible to remove them; and hence the parts of the burner cannot be dismembered to facilitate convenient and thorough cleaning of it to maintain an effective hot blue flame. Burners of this class have also usually been rigidly and permanently fixed to or within the gas-stove or other support with which they are used—thus making it impossible to remove them by persons using them, and rendering the cleaning operation all the more disagreeable and uncertain. It is claimed that the present invention fully obviates these difficulties.

Workmen's Gas-Lamps.—Fritz, F., of Berlin. No. 22,549; Dec. 24, 1891.

This invention relates to workmen's and other gas-lamps in which a burner is employed having an interchangeable tube for reducing the pressure of the gas coming from the service, as well as a device for heating the gas before ignition. The base of the burner is provided with an interchangeable tube or tip, the upper end of which is bored or slotted according to the pressure in the service and the quantity of gas to be consumed, and through which the gas must flow before it reaches the burner slot or openings. The borings or slots are so chosen that the gas pressure is reduced to such a degree before its exit from the burner that it issues without pressure. Besides the saving in gas thus produced, the patentee also claims to attain a preparatory warming of the gas in the burner by providing the shell carrying the tip or burner with a cup-like part, the bottom of which is perforated so that the gas is compelled to pass round and over the cup, and then downwards to the lower opening of the burner; and in doing so it becomes warmed by coming in contact with the hot walls of the shell and cup. In order to avoid all flaring or unsteady burning of the flame and to render it "steady and brilliant," the inventor proposes to employ a chimney of elliptical section surrounding the upper part of the flame. This is preferably made from sheet metal, so as to be warmed by the flame and air drawn into it. The air flowing into the chimney has the tendency to also force the flame into the chimney, and give it a uniform and regular form.

APPLICATIONS FOR LETTERS PATENT.

5538.—Ketchum, O. W., "Gas-generating furnaces or gas-producers." March 21.
5647.—Dungley, J., "Fittings for gas and other similar pipes and tubes." March 22.
5740.—Bilbault, P., "Gas and petroleum engines." March 23.
5994.—Rudd, J., "Increasing the illuminating power of gas." March 28.
6000.—Hunt, C., "Gas-washing apparatus." March 28.
6019.—Herzog, C., "Gas generator to be independent of climatic variations." March 29.
6020.—Herzog, C., "Regulating the quality of an artificial gas." March 29.
6062.—Bolton, W., and Davis, G. E., and A. R., "Purification of coal gas." March 29.
6175.—Boult, A. J., "Lamps or burners." A communication from G. Barthel. March 30.
6188.—Chandor, L., "Increasing the illuminating power of flames." March 30.
6240.—Owen, E. T., "Motors to be operated by either gas or liquid hydrocarbons." March 31.
6284.—Chatterton, B., "Use of steam, and afterwards gas, as working fluids in the same cylinder for the generation of power." April 1.
6313.—Hartland, T. G., and Evans, J., "Receptacles for electric and other wires, gas piping, and the like." April 1.
6314.—Lamb, J., "Automatically regulating light." April 1.
6316.—Ford, H. H., and Tavenor, H., "Generator furnace." April 1.
6362.—Lamarre, C. B. de, "Manufacture of illuminating gas." April 1.
6381.—Brookes, W., "Governors for regulating the pressure of gas." April 2.
6384.—Hall, D. M., and Kindler, C., "Gas burners." April 2.
6388.—M'Innes, A., "Furnaces and gas-producers." April 2.

What Union Miners Think of their Leaders.—According to an incident which occurred a few days ago in connection with the strike of coal miners in Durham, there is a growing disaffection towards the Federation Board, against the members of which some very uncomplimentary language has been used. It is thought that, had it had not been for them, terms would have been made long ago, and in favour of the miners. The following resolution, passed by the miners employed at South Hetton, will show with what contempt some sections of the men are treating their leaders, and the views they hold with regard to the recent ballot: "That we take the present ballot under protest, seeing there is no change in the situation since the last ballot; and we are of opinion that the persistent efforts of the Board to ram their services down the throats of the men are retarding instead of bringing about a settlement of the dispute."

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Yield of English and American Gas Coals.

Sir,—In reply to the letter of Mr. E. H. M'Cullough on the above subject, in the current issue of the Journal, the figures to which he refers, relative to the average yield of Newcastle coal, are taken, as stated in my article, from Mr. Newbigging's "Handbook for Gas Engineers and Managers." It would be beyond the scope of the series of articles on "Coal Gas" for me to particularize on the working results of individual undertakings using specific classes of coal. For information on this point, I cannot do better than refer Mr. M'Cullough to the Board of Trade Returns as to Gas Undertakings in the United Kingdom, which can be obtained in London for a small sum, or to the summarized returns periodically published in the Journal.

April 6, 1892. The Writer of the Articles.

Profitable Tar Firing.

Sir,—The residual products from the manufacture of gas being at such low rates, especially tar, I take this opportunity of expressing surprise that the latter product has not been in more frequent use as fuel for retort-furnaces, particularly in places where there is a good demand for coke. A few years ago, tar burning was put into practice in a great many works; and in most cases, after a short trial, was discontinued, owing to the damage it did to the retorts. I, with others, suffered from this cause; and, in consequence, two years ago I erected a retort-bed specially for the purpose—giving plenty of room for the proper combustion of the tar. During the last two winters I have reaped the full benefit of the experiment; having burnt in the meantime 100 tons of tar, carbonizing 4 to 4½ tons of coal daily, every ounce of coke from which was sold. Therefore, for £65, the present value of the tar used, I have 230 tons of coke; and this at 18s. per ton, which I take to be the average price, makes a total of £207. This tar bench was taken up the first week in November, and let down at the latter end of February doing the bulk of the work of gas making here during the heaviest part of the winter.

I may say, in conclusion, that the retorts in this bed have not suffered from the liquid fuel so much as is generally the case from coke firing.

Bodmin, April 9, 1892. J. Thomas.

New Joint-Stock Companies.—The Gas Economizing Foreign Patents, Limited, has been registered with a capital of £3600, in £1 shares, to carry into effect an agreement expressed to be made between R. J. Hawkins of the one part and the Company of the other part, and generally to manufacture and deal in hydrocarbons and other materials for carburetting gas. The Gas Power Syndicate, Limited, has been registered with a capital of £60,000, in £1 shares, to carry into effect an agreement expressed to be made between Ernest H. Garze of the one part, and the Company of the other part, for the acquisition of any patents, patent rights, inventions, concessions, &c., and to develop and turn to account the same in such manner as the Company may deem expedient.

Loans to Metropolitan Local Authorities.—An important departure in respect of the borrowing of money for sanitary and other Metropolitan improvements was unanimously agreed upon by the Vestry of Shoreditch last Tuesday evening; they having decided to avail themselves of the powers conferred on them by the Local Loans Act, 1875, by issuing £40,000 inscribed debenture bonds at 3½ per cent., in multiples of £10, for the purposes of dealing with the insanitary areas which have to be cleared under the Housing of the Working Classes Acts. The debt will be redeemed by equal annual appropriations of principal and interest combined, spread over a period of 50 years. After carefully considering the reports of the Vestry Clerk (Dr. H. Mansfield Robinson) and their Accountant (Mr. Ernest A. R. Adams), the Vestry resolved to issue the bonds at 99 per cent., under the official sanction of the Local Government Board.

An Accident at the Shipley Gas-Works.—Owing to an accident at the Shipley Gas-Works, there was a scarcity of gas in the town last Tuesday, and in the early portion of the evening the streets were in darkness. About nine o'clock on Monday night, it was noticed at the works that there must be an escape of gas somewhere; and instructions were given to stop the manufacture until the source of the leakage was discovered. A diligent search was made; but it was not until about noon on Tuesday, that the point of leakage was found. Then it was detected that the end of the principal main from the retorts had broken off, and had sunk in the tar well, and so allowed the gas to escape. The result of the accident, had there been any naked lights in the immediate vicinity, must, of course, have been very serious. Happily, however, no greater damage resulted from the breakage than a loss of gas and consequent inconvenience to pedestrians owing to the public lamps not being lighted. At the Midland Railway Station oil-lamps had to be substituted for gas in the signals.

The Finances of the Darlington Corporation Gas and Water Departments.—At the meeting of the Darlington Town Council last Thursday, Mr. Barron reported that the half-yearly balance-sheet of the Gas Committee was most satisfactory, and showed that they were working in the right direction. The actual expenditure was £9991; whereas in 1890 it represented £10,800 odd. By an alteration in the works and a better supply of material, they had been able to produce gas at less cost; and he had no doubt as the works further progressed the saving would increase. The decrease in expenditure had been accompanied by a considerable increase in consumption. The net profit for the year was £1536, and of this they handed over £1500 towards the reduction of the rates, as compared with £1300 in the previous year. Alderman Harding subsequently submitted the balance-sheet of the Water Committee. The profits for the year, he said, amounted to £2009, and £2000 was to be handed over towards the rates. He hardly expected the current year to do so well on account of trade difficulties.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bills read the first time: Airdrie and Coatbridge Water Bill; Lanarkshire (Middle Ward) District Water Bill.

Bills reported: Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water Bill; Glasgow Corporation Water Bill; Ipswich Corporation Bill; Pontypridd Water Bill; Swansea Corporation Water Bill; Swinton and Pendlebury Local Board Bill; Western Valleys (Mon.) Water (Gas Purchase) Bill.

Bills read the third time and passed: Oxford Gas Bill; Rhymney Valley Gas and Water Bill; Southborough Local Board Gas Bill; Tredegar Local Board Water Bill.

HOUSE OF COMMONS.

Monday, April 4.

RETURNS AS TO GAS UNDERTAKINGS.

On the motion of Sir M. HICKS-BEACH, returns were ordered relating to all authorized gas undertakings in the United Kingdom; in the case of companies, for the year ending Dec. 31, 1891, and in that of local authorities, for the year ending March 25, 1892.

THE CONSTITUTION OF THE COMMITTEE ON THE BIRMINGHAM WATER BILL.

Mr. D. THOMAS moved to increase the number of members composing the Select Committee on the Birmingham Water Bill to eleven, by the addition of Mr. Thomas Ellis (Merionethshire), and a member to be nominated by the Committee of Selection.

Mr. J. CHAMBERLAIN opposed the motion. He said it was the business of the Welsh members, if they wanted to secure representation, to do so when the Hybrid Committee was appointed.

Mr. COURTNEY admitted that it was desirable that there should be on the Committee a member representing Welsh opinion. Action, however, should have been taken in the matter when the names of the members to be nominated on the Committee were originally proposed to the House.

Mr. LABOUCHERE remarked that the Welsh members had not interfered earlier, because they had trusted that the Committee of Selection would nominate a Welsh member upon the Committee. He did not think that mere technicalities should be allowed to prevail in a matter of this kind; and an admitted injustice to Wales should be remedied.

Mr. COLLINGS said the question was regarded as if Wales had a predominant interest in the matter, and therefore should be specially represented; but if this were the case, all the counties through which the water supply would come ought also to be represented on the Committee. When the Committee was appointed, ample provision was made for all interests; and now, after three or four days' hearing of evidence, it was too late for the honourable member to come forward with his present proposal.

Mr. W. JAMES said he should be glad to be relieved from service on the Committee; and would withdraw in favour of someone else.

Mr. J. CHAMBERLAIN said he would not make any objection to that.

Dr. CAMERON said the appointment of the honourable member for Gateshead (Mr. James) had been made by the Committee of Selection; and the principle which regulated the action of that Committee was that, while the House put on partisans, the Committee nominated impartial and judicial men. The withdrawal of the honourable member could not, therefore, be accepted.

The House divided, and the numbers were: For the motion, 120; against it, 150—majority, 30.

Mr. THOMAS then notified his intention of moving that Mr. James be discharged from the Committee, and Mr. A. J. Williams (South Glamorganshire) appointed.

The SPEAKER said it was not becoming to challenge an appointment made by the Committee of Selection; and perhaps some amicable arrangement might be come to.

Thursday, April 7.

THE LONDON WATER BILL.

Sir J. LUBBOCK, in moving the second reading of this Bill, said it would be unnecessary for him to go into questions as to the quantity or purity of the water supply of London. The population had of late years increased from 3,350,000 to 5,700,000; and the demand for water for the service of the Metropolitan area had increased proportionately. The maximum quantity which could legally be taken from the Thames was 130 million gallons, and this limit was being gradually approached. Beyond this, it should be understood that if the House should grant powers for a new supply that day, it would be ten years or more before it could be obtained. He was glad to say that, in regard to this question, the London County Council were in agreement with the City Corporation, and that he was, therefore, moving the second reading of the Bill as the representative of both these bodies. The Bill proposed to constitute a Joint Water Committee to deal with the whole question of the London Water Supply, the Corporation having power to name any competent persons to represent them; and although, as the Bill stood, the County Council would be limited to their own members, he thought there was force in the representation of the Committee of last year that there should be freedom of selection on the part of that body. Objection had been taken to the Bill by the Water Companies that it would authorize the County Council to introduce Bills into Parliament for schemes competing with the existing undertakings; but all that was asked was that London should be put in the same position as other municipalities. It was also said that the Bill was not now so necessary as it was, and ought not to be pressed forward at the present moment, when a Royal Commission had been appointed to inquire into the subject. But from his point of view, the fact that the Government had seen fit to appoint this Commission accentuated the desirability of passing such a measure as the one now submitted. He might, however, state that, owing to the appointment of the Commission, the promoters had materially modified the Bill. Clause 5, which proposed to give the County Council power to examine the Companies' plant, works, and accounts, would, in deference to the wishes of the Companies, not be pressed; and with regard to clause 3, conferring authority to introduce Bills, it was intended to retain only the general powers.

Mr. RITCHIE said he had gone through the Bill in conference with the representatives of the Corporation and the County Council; and he was glad to say that they had agreed to meet the objections he had offered to some of the clauses. The Government were originally of opinion that it would have been better to have followed the suggestions made by the Committee of last session; but they had acceded to those of the Corporation and the County Council, and the House would probably admit that, both in regard to the *personnel* of the Commission that had been appointed and the instructions given to it, the Government had done their utmost to meet the circumstances of the case. It had been already explained that the Government had found it impossible to assent to the clauses enabling the Corporation and the County Council to institute inquiries into the matters at issue, and to examine the works of the Water Companies, at any rate until after the report of the Commission. Beyond this, he had objected to clause 3, which gave power to the County Council to introduce Water Bills; but at the same time he accepted the assurance given by Sir J. Lubbock on this subject. What had been conceded was that in future the County Council should have the same powers as were accorded to other municipal bodies in regard to the introduction of these measures.

Colonel MAKINS, in whose name the following notice stood upon the paper: "To move that it be an instruction to the Committee that they do insert clauses in the Bill for carrying out the recommendations in the special report of the Select Committee on the London Water Commission Bill, presented to the House of Commons on July 14, 1891," said that the Water Companies were perfectly satisfied with the action of the Government and of the President of the Local Government Board. The Bill in its original shape was very objectionable; but now there remained in it very little to which exception could be taken. It now, no doubt, carried out most of the recommendations of the Committee which sat last year; but in one important respect it failed to do so. The Committee laid great stress on the point that countenance should not be given to any desire on the part of the County Council to introduce competing measures as against the Water Companies. If competing Bills were to be brought in, a large amount of the ratepayers' and the shareholders' money would be wasted in vain legislative schemes. It was quite true that other large towns possessed the power to promote Bills; but he was not aware that the authorities of other towns had ever shown the same feeling of antagonism towards the local water companies as had been displayed by the members of the London County Council, and there was no case in which the rights of the water companies in the country had been acquired compulsorily without arbitration. Feelings of the most violent and unjust character had been manifested against the Water Companies by certain members of the London County Council, and especially by Sir T. Farrer. It was only recently that he gloated over the ruin which he thought had been brought upon the Companies by the labours of himself and others; and, in proof of what had been done in this direction, he referred to the great fall which had taken place in the value of the Water Companies' stock. What did that fall in the value of their stock really mean? Simply that a great deal of unnecessary loss and pain would be inflicted on a large number of widows and orphans. But, after all, the reduction in the Stock Exchange prices had nothing to do with the real value of the property. If the present Acts of Parliament were maintained, the property would always retain its value. The Companies were created by Parliament, and said they were perfectly content to rest in the hands of Parliament; and if the right honourable gentleman who moved the second reading of the Bill would give an assurance that the County Council did not intend, by means of the Bill, to bring forward measures in competition with the Companies, and thus unfairly to injure them, he would withdraw his opposition. It would be very desirable, however, that a clause should be inserted in the Bill making this point clear. As to the instruction he had put on the paper with the view of bringing the Bill absolutely into accord with the report of the Select Committee of last year, he thought that, after the very fair and moderate way in which the second reading of the Bill had been moved, and after the speech just made by the President of the Local Government Board, he and those who agreed with him might rest satisfied that justice would be done in the matter. Having made this protest, therefore, in the interests of those whom he represented, against any policy of confiscation in regard to the Water Companies, he begged to give notice that he should not move the instruction that stood in his name.

Mr. STUART complained that the attitude of Sir T. Farrer had been misrepresented by the honourable and gallant member, who seemed to think that the first step the London County Council should be compelled to take was to buy the water undertakings, and to do so at their existing market value. [Colonel MAKINS: No, no; by arbitration.] He would point out that the anticipation of an early arrangement to purchase was a very easy means of keeping up the value of the Companies' shares; but, on the other hand, the alleged fall in their value showed that there was no need of hurry to carry it out. As to the County Council introducing Bills for a competing water supply, he could only say that power to bring in such Bills was in no sense coextensive with the probability of their being passed. There was no question in this case of granting to the County Council any privilege or rights other than those possessed by every other municipality in the country. All they sought was the right to promote certain Bills, which when introduced, would be considered and decided upon by the House on principles of justice and fairness to all parties.

Sir J. LUBBOCK said he wished merely to add that clause 5 would not have been introduced into the Bill if it had been known that the Government had intended to nominate a Royal Commission on Water Supply. That Commission having been appointed, the clause was unnecessary, and he should propose to withdraw it in Committee. As to clause 3, it was not introduced by the County Council in any

combative spirit; and they were quite willing to accede to the suggestions made by the President of the Board of Trade.

The Bill was then read a second time.

ALKALI, ETC., WORKS REGULATION ACT, 1881.

A Bill to amend the above-named Act was brought in by Mr. Ritchie and Mr. Long, read the first time, and ordered for second reading.

The following progress was made with Bills last week:

Further Standing Orders complied with: Barrow-in-Furness Corporation Water Bill.

Bills read the first time: Bradford Corporation Water Bill; Liverpool United Gas Bill; Oxford Gas Bill; Rhymney Valley Gas and Water Bill; Southborough Local Board (Gas) Bill; Tredegar Local Board (Water) Bill.

Bills read a second time and committed: Bristol Gas Bill; Cleator Moor Local Board Gas Bill; London Water (No. 1) Bill.

Bills reported: Blackburn Corporation Bill; Mold Water Bill; Rhyl District Water Bill; Rhyl Improvement Commissioners Bill; Stamford and St. Martin's Stamford Baron Gas Bill.

Bills read the third time and passed: Airdrie and Coatbridge Water Bill; Lanarkshire (Middle Ward District) Water Bill.

Petitions against the London Water (No. 1) Bill were presented from the New River and other London Water Companies, the Corporation of Croydon, the Corporation of West Ham, the Hertfordshire County Council, the Provincial Water Companies' Association, and the West Kent Main Sewerage Board.

HOUSE OF COMMONS COMMITTEES.

Thursday, March 24.

(*Before Mr.* HERBERT GLADSTONE, *Chairman; Mr.* W. F. LAWRENCE, *Mr.* C. CAMERON, *and Mr.* BONHAM-CARTER, *Referee.*)

SOUTHEND GAS BILL.

This Bill, by which the Southend Gas Company seek power for the construction of works, the raising of additional capital, and other purposes, came before the above-named Committee to-day.

Mr. LITTLER, Q.C., and Mr. RICKARDS appeared for the promoters; Mr. PEMBER, Q.C., and Mr. CLAUDE BAGGALLAY for the Southend Local Board, who had petitioned against the Bill.

Mr. RICKARDS, in opening the case, said that one of the objects of the Bill was to enable the Company to raise additional capital to the extent of £45,000. The reason they were before Parliament this year was briefly that, having been incorporated as a limited liability Company in the year 1854, when the Companies' Clauses Act was passed in 1862 they were re-registered under that Act, but without any changes in their constitution, except those which were brought about by the passing of that Act. They became possessed of parliamentary powers for the first time in 1877; and therefore they had found it necessary, having called up and expended all their existing capital, to come to Parliament and ask for further powers. They desired authority for the construction of additional works for the manufacture and storeage of gas; and also for making a jetty or landing-stage which would be at the extremity of the town. He did not know how far it projected across the foreshore; but at any rate the Company had to comply with certain rules of the Board of Trade with respect to any encroachment upon the foreshore, and that Board had submitted clauses to the Directors which they had agreed to put into the Bill.

Mr. *C. Woosnam*, Chairman of the Company, was the first witness. He stated that the demand for gas had been steadily increasing every year. In the year 1885 the sale of gas was 18,456,000 cubic feet; in 1891, it was 29,625,000 cubic feet. The works of the Company at the present time were not sufficiently large to meet the increasing demand made upon them. Their immediate necessities did not require so large an amount as the £45,000 asked for; but they would spread the expenditure over a number of years as required. He thought the jetty and landing-stage would be in every way desirable, and an advantage to the town. It was proposed to carry a line of rails along the jetty and by the Company's private road into their works. The system adopted by the Company had been to reduce the price of gas whenever there was an opportunity; and the figure was now a good deal less than half what it was when they first started. They charged originally 10s. per 1000 feet; but the population was a mere nothing at that time. Now they had come down to 4s. 5d.; the maximum being 6s. The Company had decided to adopt the sliding scale.

Cross-examined by Mr. CLAUDE BAGGALLAY, witness said, with regard to the supply of gas for public lighting, the Company received for the lamps belonging to the Local Board, 40s. 6d. per annum, for which sum they lighted and extinguished the lamps and kept these and the lamp-columns in repair. As to their own lamps, they had 5 per cent. upon the outlay—equal to an additional 3s. per annum. They obtained their coals at the present time by the Great Eastern and the London and Tilbury Railways. There was difficulty in getting coals by water; because they had to take their carts alongside the vessel and pull them up the beach, which meant a great deal of labour and expense.

Re-examined by Mr. RICKARDS, witness said that on their present make the storeage capacity was less than their manufacturing power. They had fixed the standard price of 4s. 6d. per 1000 cubic feet upon the calculation of supplying gas having an illuminating power of 14 candles; and although, as a matter of fact, they gave very nearly 15 candles, they could not afford to be put under an obligation to supply this quality at that price. If they had a higher illuminating power, they must have a higher charge. The accounts of the Company had always been made out in accordance with the form prescribed.

Friday, March 25.

On the re-assembling of the Committee this morning,

Mr. *Corbet Woodall*, M.Inst.C.E., was called in support of the application. He said he had inspected the Company's works, and was of opinion that the proposals contained in the Bill were fair and reasonable. Since the Company came to Parliament in 1877 they had had a career of steady progress and success, especially in recent years. Between 1881 and 1891, the quantity of coal used had increased 99 per cent.; the gas sold, 112 per cent.; the revenue from gas, 87 per cent.; and the capital employed, 61 per cent. The capital had grown at a smaller rate than the business done, which implied that the money had been spent judiciously. The effect of this was important to the consumers, as would be seen from this: In the year 1881 the amount required to pay dividend and interest (assuming the full rates had been paid) was £1350, which was equal to a charge of 23·6d. per 1000 cubic feet of gas sold. In 1891 the amount required to pay the same dividend and interest was £1560, which was 15·2d. per 1000 cubic feet. Judging from the appearance of the town, and the buildings in progress, he saw no reason why the consumption of gas should not continue to increase at the usual ratio. He found that in the last three years the increase had been 11 per cent., 9 per cent., and 14 per cent. respectively in the quantity of gas sold; and if the latter rate was maintained, the business would be doubled in five years. He had been carefully over the works of the Company, and found the apparatus and plant in a very satisfactory condition—showing proper care and administration. Portions of the plant at present required extension. The gasholder capacity was too low; being about 65 per cent. of the maximum output, and it ought to be more than 100 per cent. With regard to the proposed jetty, he understood the coal for the Company was brought from the Silkstone district by rail to Southend, and carted from the railway station, through the town, to the works. This was an expensive way of getting the raw material; and he was in entire accord with the Company in their proposal to establish the jetty for the purpose of discharging the coal just opposite their own gate. He considered it would be necessary to spend £6000 at once in order to make the works and plant fully equal to the demand. The Bill provided that £6000 might be spent in the first year after obtaining the Act. The new share capital asked for was £45,000, with borrowing powers for £11,250; and he estimated that this would carry the Company forward for 10 to 15 years. With regard to the allegation of the Local Board, that "the construction of additional works, and the raising of additional capital, did not arise from the increased consumption of gas, or other ordinary necessities of the case," he thought this was a very foolish contention, and one which would hardly have been raised if it had been thought over.

Cross-examined by Mr. PEMBER, witness admitted that there was a strong tendency in the present day to transfer gas and water undertakings to local authorities; but it was less strong than formerly. If the Bill passed, he did not think it would be necessary for the Company to go to Parliament again for 12 or 15 years.

Re-examined: If the Southend Local Board wished to buy the gasworks, the proper course was to go to Parliament with a Bill of their own for the purpose; or they could approach the Company and offer them terms.

Mr. *Henry E. Jones*, M.Inst.C.E., gave corroborative evidence. He said the remoteness of Southend from the coal-fields made it very important to have an expeditious and proper mode of getting the raw material into the Company's works. Steamers could not come up to the town, as the beach was not suitable for it; and the coals had either to come by railway or in small sailing vessels and lighters. As a fact, if they came by sea, they were brought up to London and then sent down again in lighters; and the cost was therefore a great deal higher than it was in London.

This concluded the case for the promoters.

Mr. BAGGALLAY said, with the Chairman's permission, he would call evidence for the opponents before addressing the Committee.

Mr. *S. Wood*, of the firm of Messrs. Alfred Lass, Wood, and Co., said he had examined the published accounts of the Company, and found that the capital expended had been £26,051.

Mr. *E. H. Stevenson*, M.Inst.C.E., of the firm of Stevenson and Burstal, said he had visited the works of the Company, and he did not consider them to be well designed, because of their great variation. This led not so much to extravagance in the cost of production as to high expenditure upon certain parts of the works. A considerable number of years had to elapse before the growing wants of the district picked up the extra power which had been provided. With the exception of the gasholder and some small apparatus, the Company had sufficient plant to last them for some years; but, of course, not enough for the interval until they would go to Parliament again. The erection of the proposed jetty would certainly not be advantageous, as affecting the cost of the gas. He knew of no reason why the existing public jetty should not be used for the purpose of landing coals. He believed the total cost of the jetty and plant would not be less than £4400—£2900 for the jetty, and £1500 for the plant. In his opinion, the consumption of gas at Southend would double in about eight or nine years; and he thought the existing works, and those which were being carried out, would be sufficient for an increase of about 50 per cent. On these grounds, he thought the additional capital asked for by the Company was about four or five times too much, and that about £7000 would carry them on until 1905. The gasholder, they were told, was to cost about £5000; and then, of course, there was the expense of the Act now applied for, which he put at £1000. This was rather more than the Company paid for their original Act. The cost of the land—it was a sort of marsh land—he put at £500. He thought another £800, in addition to these items, would carry the Company for six or seven years from now; and he should say a further £7000 would carry them on for another seven years from 1905. This would make a total capital which he thought ought to be given, for the 14 years, of about £14,000 to £15,000. He had not included the jetty in that. In his opinion, the standard price proposed was high. The Company stated that if they were allowed to make the proposed jetty, there would be a saving in the price of coal of 1s. 11d. per ton, or equal to about 2¼d. per 1000 cubic feet of gas sold. If the Company used the public jetty, instead of making one of their own, they would save about another 2d. Allowing for the price of carting, they would be able in this way to reduce the price of gas between 3¼d. and 4d. per 1000 feet—say, 3½d., to be certain. He thought a standard price of 4s. would be more than sufficient to pay the standard dividend. Gas of 15-candle power was

almost the invariable minimum now. He thought it was desirable that the Local Board should have the power to purchase the gas undertaking in a case like this; and certainly the Company would not be damaged in any way thereby.

In cross-examination by Mr. LITTLER, witness said he could not give any instance of a company having a purchase clause, like the one proposed by the Local Board, put upon them against their will, nor of a standard price lower than the actual price being imposed by a Committee. He did not mind giving the Company a fair margin beyond the selling price; what he objected to was giving them such an amount of capital as would keep them from Parliament for 30 or 40 years.

Monday, March 28.

To-day additional evidence was adduced for the opponents.

Mr. *W. A. Valon*, Assoc.M.Inst.C.E., said he agreed that the amount of capital named by Mr. Stevenson would enable the Company to treble their output, and make provision for trebling their consumption. He also thought that 4s. per 1000 cubic feet would be a very fair initial price; and he certainly considered that the Company would be able to save about 3½d. per 1000 cubic feet of gas, if they had coals brought by water and used the Local Board's jetty.

Mr. *J. H. Burrows*, Chairman of the Southend Local Board, also gave evidence.

Mr. PEMBER then addressed the Committee in opposition to the Bill. He said that a great number of points had been settled between the parties, but four or five still remained. Dealing first with the proposed jetty, he contended that its erection would necessitate an outlay of some £4000, and that it was clearly not worth while to construct it. He also submitted that the amount of capital asked for was—even with the auction clauses—outrageously extravagant. Mr. Stevenson had suggested that £14,000 would be a fair amount. But if the Committee gave the Company £20,000, it must be ample for anything they would need for 12 or 14 years; and then it would be time for them to come to Parliament again, so that the people of Southend could take advantage of any new legislation in regard to gas companies. He certainly thought that, at the outside, the Company should be allowed to have £16,000 of additional share capital, and borrowing powers for another £4000. He reminded the Committee of the evidence given by Mr. Stevenson as to what the standard price ought to be; and he (Counsel) asked them to fix it at 4s.

Mr. LITTLER having replied, the room was cleared.

On the re-admission of the parties,

The CHAIRMAN announced that the Committee considered the preamble of the Bill proved; but with regard to the capital, they were of opinion that instead of £45,000 it should be £28,000, with the usual borrowing powers. The standard price they also thought might stand at 4s. 6d.; and the illuminating power of the gas was to be raised to 15 candles.

The Bill, as amended, was then ordered to be reported.

Tuesday, March 29.

(*Before Sir* S. NORTHCOTE, *Chairman; Sir* J. COLOMB, *Mr.* CRAIG, *and Sir* J. O'CONNOR.)

ORMSKIRK GAS BILL.

This Bill, which was promoted by the Ormskirk Gas Company to obtain authority to extend their limits of supply to Maghull, Melling, and Lydiate, to erect additional works, to alter the price of gas, and to consolidate the shares or stocks of the Company, was considered by the above-named Committee to-day. The Lancashire County Council and the Ormskirk Local Board petitioned against the Bill, but the promoters settled with them; and the only opponent was Mr. J. M. Idle, a shareholder of the Company.

Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN appeared for the promoters; Mr. IDLE conducted his own case.

Mr. BALFOUR BROWNE, in his opening remarks explained that the Company proposed to raise additional share capital to the amount of £20,000; and they sought power by the Bill to do this, and also to borrow to the extent of one-fourth more. The money was needed for an extension of the works, including the erection of a new retort-house. With regard to the quality of the gas, it was proposed to put the illuminating power at 15 candles; no definite standard being at present required of the Company. Dealing with the opposition of Mr. Idle, the learned Counsel said that gentleman's fear was that the Company would lay out money in supplying districts that would be unremunerative. This fear, he assured the Committee, was absolutely groundless. It was peculiar, too, that Mr. Idle had increased his holding in the Company since the Bill was promoted; but he could not expect his views could prevail against the desire of the rest of the proprietors.

Mr. *J. Martin*, Engineer and Manager of the Company, said that further capital was required for the development of the undertaking; and the money would be spent at once on a new retort-house, new mains in Ormskirk, and a new tar and liquor well. The Bill would extend the area of the Company's supply to Halsall and Carisbrick as well as to Malling and Maghull, which were fast becoming residential districts for Liverpool merchants. Unless the persons in these districts who required gas guaranteed a certain payment, the Company were not bound to supply them; and unless such guarantees were obtained, they certainly would not supply gas. He saw no ground for the fears which Mr. Idle entertained that the extension of the mains to these places would be detrimental to the interests of the Company. Witness added that in 1871 the consumption of gas in the district was 10 million cubic feet; in 1881, it was 16 millions; and last year it had risen to 27 millions.

Cross-examined by Mr. IDLE, witness stated that, although the population in the district of supply had not increased, the consumption had; and the price charged in Maghull would all depend upon the demand and upon the consumption. The Ormskirk Local Board had insisted upon a reduction of the Company's maximum price by 1s. per 1000 cubic feet; and so did the Chairman of Committees of the House of Lords (Lord Morley)

Mr. IDLE: Does not that justify my statement at the meeting of the Company, that you would not come back with all the privileges you now possess?

Witness: But we do not charge our maximum price of 6s. 6d. We only charge 3s. net. The price varies in the different districts.

Re-examined: Inquiries had satisfied him that the proposed extensions would be remunerative to the Company.

Mr. *T. Ally*, Chairman of the Company, said that the whole of the authorized capital of the concern (£20,000) had been called up and spent, and the present borrowing powers exhausted. His opinion was that the extended powers would be advantageous to the Company.

Mr. IDLE then proceeded to argue that the Bill was unnecessary, and that it was unjust to the Company to double the capital.

The Committee found the preamble proved; and they then proceeded to go through the clauses. As originally presented, the Bill contained three clauses relating to the recovery of money by distress. These the Home Secretary, in his report on the Bill to the Chairman of the Committee, recommended should be excluded; and they were accordingly struck out. Other amendments were made; and the Bill was subsequently reported to the House.

The Coze Inclined Retort System.—We learn that the Leigh Local Board (Gas and Water Department) and the North-Eastern Railway (Gateshead works) have decided to erect the system of inclined retorts under licence from the Automatic Coal-Gas Retort Company, Limited.

Reduction in Price at Cradley Heath.—The Directors of the Cradley Heath Gas Company have, at the request of a deputation of gas consumers which recently waited upon them, decided to reduce the price of gas from 3s. 9d. to 3s. 3d. per 1000 cubic feet to consumers of less than 50,000 cubic feet per quarter, and from 3s. 3d. to 3s. to those burning more than that quantity.

Damages for Accident to Mrs. Thwaites.—At the Glamorganshire Assizes, held at Cardiff last Thursday, Mrs. Thwaites, the well-known lecturer on cookery, recovered from the Cardiff Park Hall Company £50 for neglect on the part of servants of the Company in not lighting the vestibule leading to the hall after one of her lectures, by neglect of which she fell down, and sustained injuries to one of her legs.

Gas Explosion at Croydon.—Last Friday morning, shortly after eleven o'clock, a serious gas explosion occurred at Croydon. A few days ago complaints were made at the offices of the Gas Company of an escape of gas in Wandle Road, and some workmen were sent to open the ground. This having been done, the escaping gas became ignited by a lighted torch carried by one of the men; and an explosion immediately took place, the effect of which was to tear up a considerable portion of the roadway and footpath, and to demolish the railings in front of No. 33, and force off the roof of the greenhouse at the back. On the other side of the road, at No. 38, damage was done inside the house; while in the back garden, a distance of 60 feet from the road, three large paving-stones were raised completely out of the ground. A subsequent examination of the roadway revealed the fact that a culvert had become filled with gas through a leakage in one of the pipes. Although the Company's men were much shaken, they soon recovered, and repaired the damaged pipe.

The Public Lighting of Oldham.—In the Court of Appeal last Tuesday, before the Master of the Rolls and Lords Justices Fry and Lopes, the case of the *Attorney-General (at the Instance of the Local Boards of Chadderton, Royton, Crompton, and Failsworth) v. the Mayor and Corporation of Oldham*, came on for hearing. It was an appeal by the plaintiffs from the judgment of Mr. Justice Collins, dated Oct. 29, 1891, in an action which raised the question of the legality of the practice followed by the Oldham Corporation of supplying gas gratuitously for the public lighting of the borough, whereby the outlying Local Authorities served with gas from the Corporation's works were, as they contended, prejudicially affected. The annual cost of the gas so used was stated to be £6000; and this sum ought, it was urged, to have appeared in some shape in the municipal accounts. The views of the respective parties will be found fully set forth in the report of the case when it was in the Lower Court (see JOURNAL for Nov. 3, 1891, p. 804), when the plaintiffs failed to sustain their contentions. These were brought before their Lordships in the Superior Court by the Attorney-General (Sir R. E. Webster, Q.C., M.P.); but, in the result, the judgment of Mr. Justice Collins was affirmed.

Sales of Shares.—A sale of between 400 and 500 shares in various Suburban Gas Companies was held by Mr. Alfred Richards at the Mart, Tokenhouse Yard, E.C., on Tuesday last. Original shares in the *West Ham Gas Company*, paying 10 per cent., were sold at £10 10s. per share. Some £10 *North Middlesex Gas Company's* shares, bearing a like dividend, realized £19 2s. 6d. each. Shares in the *Woking Water Company*, £10 paid, and earning 4 per cent., fetched £10 per share. The *West Kent Gas Company's* £10 shares (10 per cent. class) sold for £18 each; and the £10 shares in the same Company on which £4 has been paid realized £5 12s. 6d. apiece. A number of *Romford Gas Company's* £5 shares, bearing 7 per cent., were sold at £6 10s. each. Original £10 shares in the *Harrow District Gas Company*, carrying 7½ per cent., brought £16 per share; the "B" £10 shares in the same Company (7 per cent.) being sold at £12 17s. 6d. and £13 12s. 6d. per share. Fully paid £10 "C" shares in the same Company, paying 5¼ per cent., realized £10 10s. per share.——On the following day, at the same place, Messrs. Fox and Bousfield sold stocks and shares as follows: *Tottenham and Edmonton Gas Company's* "B" stock, at 152 to 152¼ per cent.; *Lea Bridge Gas Company's* £10 shares, at £18; *Harrow District Gas Company's* £10 shares, at £13½; *Leatherhead and District Gas Company's* £10 shares, at £8; *Woking Water and Gas Company's* £100 4 per cent. debentures, at 99.——Last Tuesday, Mr. C. H. Morris offered for sale by auction at Lewes, £360 stock in the *Lewes Gas Company*. Several lots of £20 each realized £39; but others were withdrawn at £38 10s. —these being disposed of privately after the sale.——At a recent sale of shares in the *Horsham Gas Company*, some fully paid "A" shares (£10) fetched £19, £19 2s. 6d., and £19 5s. each. Last year a dividend of 8½ per cent. was paid on these shares; and they are capable of carrying one of 11 per cent. On the same occasion, some "B" (7 per cent.) £10 shares fetched £14 10s. each.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, April 5.

(*Before Mr. Justice* KEKEWICH.)

Gadd v. Mayor, &c., of Manchester—The Gasholder-Guiding Patents.

The hearing of this action, in which the validity of Mr. Gadd's patent for the guiding of gasholders without external framing is in question, was resumed to-day; the previous proceedings having occupied the attention of the Court from the 29th to the 31st ult. (see *ante*, p. 628).

Mr. *H. Davey* was called on behalf of the plaintiffs, and, in answer to Mr. MOULTON, said he was a consulting engineer, and had had considerable experience in such matters as the one in question. He had read the plaintiffs' specification, and was of opinion that the invention there disclosed was new at the date of the patent. There were various mechanical equivalents for a rack and pinion, including a screw working in a nut, and chain gear, in which the chain formed a flexible rack. A windlass and rope would, in special circumstances, be an equivalent; but, speaking generally, he should not say it was. A passage from Galbraith and Houghton's "Manual" stated that a rack and pinion were equivalents for an axle and rope. Professor Unwin's "Elements of Machine Design" was also referred to, to show the use of the word "gearing;" and Mr. Kinnear Clark's "Manual" had a chapter on "rope gearing." A model was put in, showing a rack and gear movement and various equivalents for it. Some of these, witness remarked, performed similar functions; but he should not term them a direct equivalent. They were well-known forms, and were used in place of racks and pinions. Going to the complete specification, witness said the various figures there shown were fair developments of the provisional specification. A model was put in, consisting of three pairs of toothed wheels, each pair connected by a drawing-chain, and forming three sides of a quadrangle, to illustrate the same thing. It was then changed so as to make one continuous chain instead of three pairs; and in this form witness said it represented figs. 11 and 12 in the specification. Figs. 13 and 14, 15 and 16, were substantially the same; they were only modifications of one thing. The drawing put in by Dr. Hopkinson was an exemplification of the specification. A model was produced to show how such a construction would act; and it was so contrived as to demonstrate how it would work either by tension or torsion. There was a great advantage, witness stated, in having round the periphery of a holder, instead of across it, the gear for preserving the equilibrium. This enabled one to attach it to the curb, which could be made strong enough to withstand the strain; while the sides were thin, and ill-adapted for the attachment to them of gear of any kind. He did not think Malam's system could be practically applied at the bottom of a gasholder. There was no suggestion in it that side-framing could be dispensed with, or that the gearing could be carried round the holder. Nicholson and Cole's plan involved side framing, and would not lead to the plaintiffs' method. In the Staindrop case, the mechanism was the same as that of a Venetian blind, and was not like plaintiffs'. Witness was questioned with regard to the other alleged anticipations, and expressed the opinion that they would not lead the mind of anyone reading them to the plaintiffs' arrangement. Wild's invention was simply the application to a pontoon of an old form of parallel ruler. There were important variations between the case of a pontoon and that of a gasholder. The nearest approach one to the other would be to have a gasholder mounted on a square pontoon; and then, if the wind pressure came diagonally, there would be a great strain on the mechanism, which would be transmitted through the material of the construction.

Cross-examined by Sir HORACE DAVEY: The term "rope, belt, or chain gearing" was, he believed, only applied where the rope, belt, or chain was used for driving one piece of mechanism by another piece of mechanism. In the model produced by witness, with the chain wheels and chains, the wheels served different purposes in the two methods of arrangement. In the first instance, one wheel transmitted motion to the other; in the second, they acted merely as friction-pulleys. This observation applied, to some extent, to the model made to illustrate Dr. Hopkinson's drawing. If the drum and pinion were removed, there would be no exact equivalent of the rack; but a like result was obtained. He could not say that in fig. 16 there was any exact equivalent of the "pinion, mitre, or other toothed wheel;" but later on the specification referred to "pinion, mitre, or other wheels," which seemed to indicate that the inventor had in his mind the use of wheels not toothed. He did find in the provisional specification the suggestion of an arrangement which did not involve the use of wheels for the purpose of transmitting motion round the gasholder.

Justice KEKEWICH remarked that he thought the word "toothed" must have been accidentally omitted in the second passage referred to.

Sir H. DAVEY said he had the same idea; but even if it were not so, he did not consider that it would materially affect the question.

Cross-examination continued: He should say the peculiar character of the invention was the holding of the bottom rim of the gasholder, at different places round the circumference, in a fixed position at all points of its rise and fall. In fig. 4, when the holder was at its lowest, the pinion fixed on the tank, which controlled the holder, was near the top; but the point of support was at the bottom, and might be only at the bottom. He did not say any means of achieving the desired object would be within the patent; but only those mentioned in the final specification. He considered the connection with the bottom of the holder was an essential feature of the invention; though it might also be attached to the top. Malam's system would be impracticable under a holder, partly because of the extra weight of girders required to carry the gear; and in modern holders it was not customary to excavate the tank entirely. It could, of course, be done as a mere question of mechanism. It was a perfectly easy transition from Wild's rectangular pontoon to a circular one; it would only require a multiplication of shafts and pinions round the circumference. Mr. Gadd said that, by preference, the shafts should all be connected together; and he considered this essential. Even where he did not connect them directly, they were brought so close together that they were virtually connected. One of Standfield's figures was exactly the same as one in plaintiffs' specification; but it was applied to a different structure. The novelty of Mr. Gadd's patent lay in the application of well-known means to a gasholder. He told the world what the object was in his patent of 1887; but the world did not make the 1888 invention. It was not obvious, on Standfield's patent that the plan was applicable to a gasholder.

Re-examined: Standfield did not suggest the application of his apparatus to a circular platform. In figs. 12, 14, and 16 in plaintiffs' specification, it would make no difference whether the wheels were toothed or smooth; the action would be precisely similar. The same object was attained in the 1887 patent, but in a different manner.

Mr. *W. F. Mason*, co-owner with Mr. Gadd of the patent in question, was the next witness. He narrated the circumstances of a conversation with Mr. Gadd, after the 1887 patent was taken out, in which that gentleman described a new method of guiding a gasholder from the base. Mr. Gadd made on the margin of a newspaper some diagrams which conveyed to witness's mind the idea he had. They included racks and pinions, and also rope and chain gearing. He explained how the mechanism was to be arranged round the holder, and what the effect would be—to cause the holder to rise evenly over the whole surface. This was very early in 1888. A patent was not taken out at once, as he was anxious to sell the 1887 patent first. He remembered the filing of the provisional specification of the 1888 patent. Before this he had seen the letter from Mr. Terrace of Dec. 7. He first heard of Mr. Pease's invention in January, 1890. He had not seen the article in the *Gas and Water Review* until that moment; and he never saw the model in the Manchester Town Hall.

Cross-examined: Witness and Mr. Gadd formed the Patent Gasholder Syndicate. He never heard of Mr. Pease's model being at the Manchester Town Hall. He knew some members of the present Gas Committee, but had only done so within the last three months. He did not hear that the Corporation required an additional lift at their Rochdale Road works; and did not see any advertisement for tenders. The conversation with Mr. Gadd was quite casual; and he did not make any note of it, or preserve the sketches Mr. Gadd drew. The conversation impressed itself upon his mind, as it was a new mode of guiding a holder. Mr. Gadd showed a rack and pinion, and also a mode of acting without any rack and pinion. Witness had nothing to do with preparing the specification.

Mr. *A. Gadd* said he remembered his father explaining in 1887 his method of guiding a gasholder by rack and pinion. Late in that year, or early in 1888, he told witness to make a sketch of it; and he prepared the drawing produced. The ink lines were his; but some of the marks were his father's. He could not now remember what the marks referred to. He made two other drawings, which were destroyed. This one was put aside as he did not know whether or not it was done with.

Cross-examined: He had made a declaration with regard to the drawing, for use in connection with some American proceedings. He believed the object was to show that his father was the first and true inventor. It said nothing about tensional gearing.

Mr. *W. Gadd*, recalled, said he took proceedings in America with regard to four patents. The tensional method was in a different patent. The one in reference to which the deposition was used was the torsional patent.

This concluded the evidence on behalf of the plaintiffs.

Mr. MOULTON then summed up the plaintiffs' case. He said the main points raised by the defendants were two—first, that the tensional system was not fairly included in the provisional specification, or, in other words, want of conformity between the provisional and the final specification; and, secondly, anticipation, mainly by Wild and Standfield. He submitted, on the authority of the case of *Woodward v. Sampson* (4 Patent Reports), that, if a man described only one method of carrying out the object of his invention in the provisional specification, he was not thereby precluded from adding to his complete specification anything which was fairly within his invention. In the present case, Mr. Gadd had clearly indicated that there were other means contemplated. He did not think that the very minute criticism which had been directed to the use of the words "gear" and "gearing" could be sustained. The drawing prepared by Dr. Hopkinson, and the model constructed to illustrate it, showed how variations could be made in the mode of carrying out the invention; and other illustrations of a similar character might have been given. All that had been done was the fair outcome of the provisional specification, even without the words "mechanical equivalents." He then quoted the case of *Woodward v. Sampson* to show that the patentee in that case described his invention by the same words as he had previously used with regard to a former patent, but that his second patent was held valid by the Court of Appeal. He then addressed himself to the alleged anticipations, in dealing with which there had to be considered, he said, the nature of the claim put forward—viz., to dispense with the external framework of a gasholder and yet retain the requisite stability, and to do this by a ring of mechanical devices arranged round the holder. The only two anticipations which were at all dangerous to his case were Wild's and Standfield's patents. No doubt Standfield's consisted of the same element as the plaintiffs had used. But it was not employed as a ring, and it was applied to a platform, not to a gasholder; and he submitted, on the evidence, that it certainly required invention to pass from one to the other.

At the conclusion of the learned Counsel's speech,

His LORDSHIP suggested to Sir H. Davey that he should address him on the construction of the specification before calling evidence.

Wednesday, April 6.

On the resumption of the hearing this morning,

Sir HORACE DAVEY proceeded to open the case on behalf of the defendants. He said he should first submit that the patent in question was altogether invalid on several grounds, but first on that of disconformity between the provisional and the complete specification. In other words, he contended that the invention described in the complete specification was not the one of which the nature and purport were described in the provisional specification. In the next place, he should argue that, according to the interpretation which had been put upon the patent, both by the Counsel and the eminent witnesses who had been called on the other side, the claim was too large, because it

covered every conceivable kind of machinery by which the purpose mentioned in the provisional specification could be effected. Thirdly, he submitted that the patent had been anticipated. He did not think it was necessary to say that it was an adaptation of an old piece of mechanism to a new and analogous use; he should go farther, and declare boldly that it was the use of an old piece of mechanism for precisely the same purpose as those for which it had been described by earlier inventors. It would be his duty to submit that both Wild and Standfield used the identical thing which Mr. Gadd (he would assume in good faith) believed he had invented. It might be that hereafter something would be said about Mr. Pease's patent, on the same ground. It did not follow that a patentee was aware of everything that had been done before. He might, in good faith, think he had produced a new invention, and take out a patent for it; but, owing to his not being so well acquainted as he might be with what was to be found in the files of the Patent Office, it would unfortunately turn out that he had been anticipated. Although Wild and Standfield carried him to all the extent to which he wished to go, he thought it material to keep the other pieces of machinery and mechanism before the Court, because they showed that the problem was present to people's minds of maintaining gasholders in the horizontal position, and that they employed tensional means, by the aid of ropes and pulleys, for effecting this object. Though they applied tension in the way that suited their objects, the particular means were identical with those employed by the plaintiffs. If they found that the minds of people had been directed to the same problem of preserving the horizontality, not only of a gasholder, but of other moving platforms on frames, by means of similar arrangements of ropes and pulleys, although placing them in a different way to that chosen by the plaintiffs, it would have an important bearing on the question of the validity of the patent. Messrs. Nicholson and Co. had an arrangement identical with the plaintiffs' of the pulleys and the cords, though they put the cords diagonally across the gasholder. Mr. Terrace's drawing, which was made on Nov. 11, 1888, just before the date of the plaintiffs' patent, was admitted to be identically the same thing as fig. 1 in the plaintiffs' specification. The only question was as to whether that design had been published. The publication relied upon was the communication of it to various persons. It was communicated to Messrs. Walker, who were tendering for some extension of the Brechin Gas-Works; and also to Mr. G. Livesey, of the South Metropolitan Gas Company, who appeared, from his reply, to have been much struck with the sketch, and to have suggested that Mr. Terrace should take out a patent for it. He also communicated the sketch to his brother, Mr. Andrew Terrace, a Gas Manager, who also showed it to various persons.

Justice KEKEWICH: If I have followed you so far, you will seek to bring the case within Lord Justice Fry's judgment in *Mapleson v. Sugg?*

Sir H. DAVEY said that was his intention. He was going to suggest this to his Lordship as a test: Was it communicated to any person in England without any conditions of confidence or secrecy? That, of course, was a question of fact for the Court to decide. He would address himself now to the construction of the patent; and he should submit that people must discover, from the provisional specification, what the nature of the plaintiffs' supposed invention was. It seemed to him that the nature of the plaintiffs' invention was the suggestion of a new means for achieving the object accomplished in a different way by the patent of 1887. Dr. Hopkinson had said that he was not aware of any mechanical device for effecting this object which would not come within the scope of the invention. If so, then it was a great deal too broad; and his Lordship would at once see the far-reaching effect it had. Two days after the provisional specification was filed, Mr. Pease, of the firm of Messrs. Ashmore, Benson, Pease, and Co., Limited, filed a provisional specification describing the tensional arrangement which it was alleged was an infringement of what was afterwards described in the plaintiffs' complete specification. Before this was filed, Mr. Pease's firm undertook a contract for the supply of new lifts to a gasholder at Manchester, and furnished a model showing the exact thing which was afterwards put up, long before there was a description of anything of the kind on the files of the Patent Office. The patentee says his "improvements relate to the construction of gas holders, and had for object the supporting of the same in their working position, in such a manner as to enable the external or upper guide-framing, hitherto employed for this purpose, to be dispensed with, and yet to give the requisite stability, although such, or a modified form of framing may be employed in connection with the improvements herein described." Now, this was precisely the object which the patentee placed before the public in his specification of 1887. Assuming it was a valuable idea, it was still public property; and therefore there was no room for any invention, except for an improved means of carrying out that idea, which had become public property. This was not a case where a patentee had a new idea, and described a practicable means of carrying it out; but one where the novelty consisted in the idea. In such cases, the Courts said that, if the same idea were carried out by other mechanical means, it was an infringement. In the present case, the novelty of the patent consisted in the idea; and though a man could not have a patent for an idea, he could have one for a practicable means of carrying it out. In this case, the idea was public property, because, if for no other reason, it had been given to the public in Mr. Gadd's previous patent of 1887. The only room for invention being improvement in the means of carrying into effect an old idea—a purpose which had been given to the world—the question arose as to what were the means which the patentee described, and where did they find the nature of his invention. They did not find it in the purpose; because, if it was for every means of effecting this purpose, he had anticipated himself. A good deal of time had been spent in examining and cross-examining the witnesses with regard to what any mechanical engineer would understand by the term "gearing," or "to gear," which was found in the specification. His witnesses would say that no mechanic, if he saw a description containing the word "gearing," would suppose that it was intended to include a rope which simply passed over a pulley, and was operated by a pull. A patentee might use a word in a different sense from that in which it was ordinarily employed by mechanics and mechanicians; but in that case he must clearly define the sense in which he employed it. There was not the slightest glimmer of a hint that the plaintiffs used the term "gearing" and "to gear" in any other than the sense understood at the date of the invention. A patentee must describe the nature of his invention; but he was not bound to state in his provisional specification all the details of the machinery by which he intended to carry it into effect.

Justice KEKEWICH: There is an instructive note on this branch of the law in the last number of the "Law Quarterly Review," in connection with the case of *Nuttall v. Hargreaves*, which expresses the principle in these words: "The law insists on the inventor, when he asks for protection, defining precisely in his provisional specification the area of protection."

Sir H. DAVEY said that in this case what the plaintiffs claimed was a totally different kind of thing from what was described in the provisional specification. Supposing Mr. Gadd had taken out a patent for his rack and pinion, and another patentee had said: "I have an improved way of effecting that object, doing away with your racks, pinions, and gearings, and having simply a rope and pulley arranged in a particular manner," would anybody have said that this was not invention which would support a patent? Mr. Gadd, like many other inventors, desired to protect his invention in America as well as in this country, and he took out two patents—one for what he called the torsional arrangement (that is, the rack and pinion, with the wheels), and another for what he called the tensional arrangement, in which he achieved the same object by means of a rope and pulley.

Justice KEKEWICH: Yes; but the American rules are probably different.

Sir H. DAVEY: Yes, my Lord, I know; but it is just as much law in America as it is here in England, that one cannot have two patents for the same invention.

Justice KEKEWICH: I think we may assume that.

Sir H. DAVEY said the inevitable inference to be drawn from Dr. Hopkinson's evidence was that the torsional arrangement was one invention, and the tensional arrangement another. The plaintiffs admitted this by taking out a separate patent in the United States. If the provisional specification entitled Mr. Gadd to show, as a means of carrying out his invention, what he called the tensional arrangement, then his claim covered every conceivable mechanical means of carrying this out, and it would also cover his patent of 1887. To say that anyone might patent an improved means of effecting an old object, and might say that everything which achieved the same end was within the patent, would be a delightful view for patentees; but it was one which was not in accordance with the law. The law required that a patentee should state the nature of his invention, so that everybody who read it could understand what it was. He might not know enough about it from the provisional specification to be able to instruct a mechanic the way to put it into practice; but, at any rate, there was no doubt about the nature of the invention, so that the world and the Courts might know that the patentee had not, by the ambiguous use of language, arrived at a patent for an invention the nature of which he had not disclosed in his provisional specification. His first two points, therefore, were: (1) That the complete specification was a different invention from that of which the nature was described in the provisional specification; and (2) that the complete specification was too large. With regard to the anticipations, they would come out sufficiently in the evidence. [The learned Counsel then cited the cases of *Harwood v. The Great Northern Railway Company*, and *Vickers v. Siddell* in support of his arguments.] With reference to Mr. Pease, his learned friend was quite right in his surmise that the substantial defendants in the case were Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees. They had put up the gasholder for the Corporation of Manchester; and, quite properly, the Corporation had required them to clear them of liability. But Mr. Pease was himself a patentee; and his provisional specification describing his arrangement was delivered two days after the plaintiffs' provisional specification was filed. A curious question of law arose upon this, upon which he admitted there was no authority. It was this: Supposing his Lordship should be of opinion that, although Mr. Gadd had not described any tensional arrangement in his provisional specification, but that this arrangement, as described in his complete specification, was not indeed what he had described, but a development which might properly be made by a patentee between the date of his provisional and that of his complete specification, and therefore included in the latter, did it follow that a person who described and published as Mr. Pease had done, necessarily infringed, when the patentee afterwards suggested a new development of his invention which was not contained in any document on the files of the Patent Office? He (the learned Counsel) was aware that there was no authority on this point; but it emphasized the argument he had urged as to the extreme importance of keeping the patentee to his specification. Even a skilled engineer like Dr. Hopkinson could not discover, from Mr. Gadd's provisional specification, anything resembling what Mr. Pease had done; and two days afterwards Mr. Pease took out a patent of his own. He made it public in the form of a model placed in the Manchester Town Hall for people to go to see who were interested in the gas-works of the city; and then the plaintiffs took out a complete specification containing everything; and said they were entitled to stop Messrs. Ashmore, Benson, Pease, and Co., and Mr. Pease personally, from making a gasholder to the model exhibited before the complete specification was filed. If this were the law, of course he must submit, if his Lordship held that the plaintiffs' patent was valid; but it showed the extreme importance of keeping a patentee, in his complete specification, to the invention the nature of which he had undertaken to describe in his own way in the provisional specification.

Evidence was then called on behalf of the defendants.

Sir *F. J. Bramwell*, F.R.S., examined by Sir H. DAVEY, said he had devoted some attention to gasholders; and amongst those which had been made from his designs was a telescopic holder for a million cubic feet. He had read the plaintiffs' provisional specification, and had found no difficulty in understanding it. It described the connecting of various points round a gasholder by means of gearing in such a way as to preserve the parallelism of the holder in rising and falling. For very many years, the word "gearing," unless there were some qualifying words, implied that there could be no slips between the parts, in contradistinction to driving by means of leather bands.

Typical gearing was a pair of toothed wheels. Gearing was a contrivance by which, unless the parts broke, there must be absolutely a relative motion; whereas, if bands were used, there might be a certain amount of slip. Of late years, since driving by ropes had been introduced, it had been the occasional practice to call this driving "rope gearing." "Chain or link gear" was a well-known term. Formerly, the transmission was made by a chain having ordinary links passed over two pulleys—one being the driver, and the other the driven. These pulleys were provided with prominences and indentations, into which the links of the ordinary chain took. They were known as "chain pulleys;" and the communicating implement was a common chain. The word "gear" had other meanings than "gearing." One spoke of "valve gear," and matters of that kind; meaning the whole combination of parts for attaining a particular end. He did not understand that, if a rope from a pulley were attached to a weight, with a man at the other end pulling the rope, there would be anything there to bear the name of gearing. He had never heard pulley-blocks, for example, spoken of as gearing. In his opinion, the word "gearing" was used in the provisional specification in an accurate sense—something which would convey to the driven thing, from the thing driving, exactly the same amount of motion as was given off by the driver. Reading the provisional specification, and having regard to the prior state of knowledge and the 1887 patent, he should understand the nature of the invention in question to be the mode of gearing described in the provisional specification for attaining the end stated in the outset clause of the complete specification, which, with the exception of a single word, was identical with that which was there before. In the absence of knowledge of the prior specification, he should have understood it to mean that it was the end to be attained; but knowing of that specification, the end being identical in both, he was driven to the conclusion that the patent was for the means of attaining that end. The words in the complete specification, "or vertical endless chains or bands passing over and between pulleys or wheels at or near the top and the bottom of the tank or holder, as the case might be," were to him unintelligible as being equivalent for a rack. A rack was a thing which was in one case stationary, with a pinion working in it, and in another case on the holder, working into a pinion. He could not conceive, therefore, how an equivalent for a rack could pass "over and between pulleys or wheels at or near the top and the bottom of the tank." "Plain chain," in his opinion, would gear, but "plain rope" would not. One could not transmit power by a plain rope, acting by friction on a pulley, with a certainty that it would transmit the same amount of motion it had received. Referring to the detailed description given in the patent, in connection with the figures, he could not conceive the utility of making link-chain in any one of the constructions, because there was nothing to drive, and there could be no reason whatever for passing a link-chain over a mere anti-friction pulley. The pulleys described did not drive anything whatever. They were mere points on the gasholder; and the functions of some of them were to prevent the holder from rising at that particular part, while the functions of others were to prevent it falling. With regard to Wild's patent (which was relied upon as an anticipation), it was, in his opinion, a practical means of securing the end aimed at. It was made of four compartments, each of which, when the caisson was at the bottom of the dock, was filled with water. Then when it was desired to raise it, and the ship was floated on to it, air was pumped in at sufficient pressure to drive out the water and gradually fill the compartment with air. At the time the air was being pumped in, there was free access between the water in the interior and the water outside; and therefore the fact of there being a bottom to the pontoon which came into use afterwards, had no bearing upon the condition of things. In explaining Wild's patent, witness pointed out that, the pontoon being at the bottom and filled with water, the ship was drawn over the keel-blocks, which were laid on the top of the pontoon in the same manner as in an ordinary dry dock. They were laid at the bottom of the dock. Then some air was pumped in until the pontoon rose a very little, so that the keel-blocks took the under side of the keel of the ship; or they waited until the keel settled down on the blocks. Then the ship was bilge-shored to the pontoon, and was ready for raising. Thereupon more air was pumped in; and as the ship was raised out of the water above its own line of flotation, it was unable to support itself, and was held up by the bilge-shores and keel-blocks in the pontoon. It was at this time that the whole thing was in unstable equilibrium, and liable to be turned over, unless means were taken to prevent it. It was then that racks and pinions were of great use. The pumping went on until the pontoon was raised gradually out of the water. The sluices were shut, which made the communication between the middle of the pontoon and the water; and then the pontoon floated, having nothing to do with the air inside, except that the water had been displaced by it, and it was quite competent to carry itself, even without the racks and pinions at all, because the danger was over—the danger existing in the act of raising or lowering. In this dock of Wild's where the expulsion of water was by air in the act of raising, the condition was, to his mind, precisely that of a gasholder. There was a body with air on the top, free communication with air at the bottom, and a body to be raised, which was exposed to the pressure of the wind. If he wished to adapt Wild's arrangement to (say) a hexagon, he should put the apparatus along the six faces. It might be done alternately; he might put three or six. He could not suggest any mechanical difference between Wild's mechanism and that described in the plaintiffs' specification. The mechanism was identical; and it would require no addition or alteration for the purpose of adapting it to a gasholder. He was old enough to remember rectangular gasholders; and if one were to take this thing of Wild's and pump gas into it by an ordinary exhauster, instead of pumping air, taking care not to blow out the gas, it would be a gasholder. Standfield's patent was for "improvements in hydraulic lifts, floating docks, pontoons, and other floating structures, and in appliances connected therewith." Speaking broadly, he should say Standfield's patent described, in general terms, the chain-and-pulley arrangement such as Mr. Gadd had described in what he called his tensional gearing. Fig. 16 of Standfield was identical with a section of fig. 16 of Gadd. In Pease's arrangement, there was no gearing in the proper sense of the term. There was simply an arrangement of roping by which, if one portion of the gasholder happened to give off rope, another portion required as much as was given off; and these ropes being doubled, horizontality was preserved. He had seen the gasholder at Manchester; and it appeared to be thoroughly effective. If he had been acquainted with the plaintiffs' provisional specification alone, it would never have occurred to him that Mr. Pease's holder was an infringement of the plaintiffs' patent. What would have occurred to him was that Mr. Pease had, by entirely different means, attained the same end as he found in Mr. Gadd's provisional specification.

Thursday, April 7.

Sir *F. Bramwell*, in cross-examination, said he first looked into the plaintiffs' and Pease's patents about a year ago, for the purpose of the present litigation. He had not considered Pease's apart from Gadd's. Many of his observations on the question of anticipation would apply to Pease's patent as well as Gadd's. He had had a good deal to do with gas engineering, but had never been Consulting Engineer to a gas company. He had designed a gasholder, and was well acquainted with many large ones. The first big holder without outside framing was the one put up at Manchester for the defendants. That was in the course of last year. Gadd's 1887 patent had not been put into operation to his knowledge before the end of 1888; the only one he knew of was that at Northwich. He had known of pontoons and floating docks for a long time. In the case of a large holder capable of containing (say) 200,000 or 300,000 cubic feet of gas, he could not say whether the saving by doing away with the guide-framing would be 30 per cent., as he had not inquired into that point. Malam's system assumed side posts; and there was nothing to indicate that they might be dispensed with. But they might be, although not so indicated, if one did not require the balance-weights. The main principle was controlled motion actuated by radial shafts gearing into a central wheel. Mr. Gadd described pinions and vertical racks, and they might be arranged as in Malam's plan—a variety of arrangement being alluded to; and special reference was made to radial and tangential gearing. Malam's description referred obviously to a central point where the shafts were geared together; and this was only shown at the top. He did not know that it could be applied to a central lift of three—it would require some arrangement; and it would not be very convenient to put it under the bottom lift. It would occur to any engineer that the horizontal shafts might be placed at an angle, so as not to interfere with the central cone of the tank, if it were left in. Wild's patent was obtained in 1850. The pontoon contemplated by him never rose out of its guides. It had two shafts and pinions, one vertically over the other, gearing into the same rack. This had the advantage of getting the strength of two teeth in the rack to act at once; but practically it had no further advantage in keeping the motion horizontal, There was no indication in Wild's specification that one shaft could be dispensed with. The pontoon had a strong solid bottom. But it was in communication with the external water at certain times; and this had the same effect as if there were no bottom. The water pressure on the bottom would not tend to preserve equilibrium until the pontoon had risen to the surface and was partly above it. In such a case it would. He adhered to the opinion that, so long as the pontoon was submerged, it was in unstable equilibrium. A gasholder had no bottom on which the water pressure could operate; it was like a diving-bell. During part of the rising of the pontoon, there would be freeboard, which would cause stable equilibrium; but in no part of the rise of a gasholder would this be the case. The pontoon would be converted into a gasholder by pumping in gas instead of air. Nothing of the kind had ever been done; and he did not know of Wild's patent having been applied to gasholders before the plaintiffs', except Malam's, which he considered to be the same principle. A pontoon was a strong structure in every way; while gasholders were very fragile and light. The endeavour was to make them as light as possible, consistently with the requisite strength. Turning to Standfield's arrangement, of which he had produced a model made as a gasholder, he did not know of its having been adopted to this purpose. The patent was intended to apply to platforms or pontoons; there was no special reference to any other floating structure.

Justice KEKEWICH remarked that the patentee, in his claim, seemed to refer to floating structures, not *ejusdem generis* with pontoons.

Cross-examination continued: A diving-bell would not be called a "floating structure;" but he should say a gasholder floated on the water in the tank, as shown by the fact that it would sink if the water were removed. There was nothing to show that, by "floating structure," Standfield meant to refer to an inverted bell sustained by fluid pressure. The models produced were made for the purpose of the present case. He understood that Wild's and Standfield's patents were the anticipations chiefly relied on by the defendants. Gasholders had been practically circular since the year 1819; prior to that they were rectangular. The circular form was preferable, on account of offering less resistance to wind pressure; and greater cubical space was obtainable for a given quantity of material. He thought there was no invention necessary in applying to a circle an apparatus suitable to a rectangle. All the plans shown in the plaintiffs' specification involved a vertical rise and fall of the holder, not a spiral motion. It was the first patent with this object that he knew of applied to gasholders. The model illustrating fig. 14 in the specification did not show any opportunity for slip. If chains were substituted for cords, it would operate in exactly the same way; so it would if link chains and toothed or pitch wheels were employed. He should not call that a link gearing which was mentioned in the provisional specification, because it would be an absolutely useless expenditure. Gearing, in his opinion, involved the transmission of power from the driver to the driven being exact, without loss or slip. In the model working with racks and pinions, in the case of wind pressure causing the holder to move, the rack would be the driver, and the pinion the driven. In the model with cords, the driver would be the rope trying to come upwards, which would pull the next rope downwards; and so on alternately round the holder.

Re-examined by Mr. CARPMAEL: The problem of preserving horizontality was, to his mind, the same in a pontoon and a gasholder. The latter was a floating structure; it displaced a bulk of water equal to the weight of gas. In his opinion, there was, strictly speaking, no driving operation in the cord arrangement.

Mr. *J. Imray* was the next witness. He agreed with Sir F. Bramwell entirely in regard to the term "gearing," and to his evidence generally. He said he should not, however, term a nut and screw a mechanical equivalent of a rack and pinion. He did not find any hint in the provisional specification which would lead him to some of the figures shown in the complete specification. Malam's arrangement was included in the plaintiffs' specification, as they specially claimed any possible arrangement of racks and pinions. The Grantham holder was also within their claim, as it maintained horizontally by means of racks and pinions geared together. With regard to the other anticipations, he corroborated the evidence of the previous witness.

Cross-examined by the ATTORNEY-GENERAL: He agreed substantially with the evidence given by Sir F. Bramwell. Worm gearing was different from rack and pinion. One was continuous, the other was not; and the motion was quite different. He had never heard of pulley gearing, but he had of rope gearing, though not of block gearing. He thought Nicholson and Cole's patent was included in plaintiffs' specification. He had never constructed or designed gasholders, and had not considered these patents until he was consulted in connection with this litigation. He had not seen the Grantham holder; but judging from the drawing, it required outside framework. Witness was questioned in the same way on the other anticipations.

Sir H. DAVEY briefly re-examined the witness.

Mr. *R. Bridge*, Gas Engineer to the Corporation of Doncaster, said that before taking his present appointment he was at the Grantham Gas-Works. He was there from 1851 to 1857, and remembered the gasholder then in use (the drawing of which he recognized) but now superseded. He understood it had been at work about 16 years prior to 1851; and he believed it was removed in 1861. The engineers who put it up were Messrs. J. and J. Malam. It had a rack at each column, of which there were four, supporting weights. Pinions worked in the racks, being connected in pairs by shafts across the top of the holder, at right angles to each other. The holder worked satisfactorily. It kept horizontal under all ordinary circumstances; though sometimes in frost and snow the pinions and racks became clogged, and had to be liberated. He was acquainted with Mr. Gadd's torsional arrangement, which would be open to the same objection.

Cross-examined: The Grantham holder was up altogether about 26 years; and he did not remember how often he had to clear the cog-wheels. It was upwards of 40 feet in diameter. The holder erected in its place was an 80-feet one, and worked with guide-wheels against posts, and with balance-weights.

Mr. *J. Fawcett*, Secretary of the Gas Company at Staindrop, near Darlington, said he knew of the gasholder there. It was erected in 1853-4; and his father was one of the contractors engaged in the work. The holder was still in use; and the model produced was correct.

Cross-examined: The diameter of the holder was 30 feet, and the rise about 12 feet.

Mr. *J. B. Terrace* said he was Engineer to the Brechin Gas Company, and had held that office for eight years. His attention had been directed to appliances for preserving steadiness in gasholders; and in November, 1888, he made a drawing of what he considered to be a new device for securing this object. The drawing produced was one of a series he then prepared; but he could not say whether or not it was the first. It had a date upon it in his own handwriting, "17/11/88." The drawing was then in the same condition as now, with the exception of some red marks which had been added.

Mr. *A. Featherstone* was interposed here, to prove the receipt of the drawing in question. He said he was Manager to Messrs. C. and W. Walker, of the Midland Iron-Works, Donnington; and on Nov. 19, 1888, he was at their London office in Finsbury Circus, and received a letter from Mr. Terrace, enclosing the drawing produced. The letter and drawing remained in his possession until February, 1891, when he sent it to Mr. Pease's Solicitors. He replied to Mr. Terrace's letter; and a few days afterwards received another one from him, dated Nov. 28, in which he requested that the plan might not be disclosed, as he thought of patenting it. Nothing further took place on the matter.

Cross-examined: Messrs. Walker had previous to that been in correspondence with Mr. Terrace, whom he did not know personally. He understood the letter of the 17th of November as asking his opinion of the arrangement suggested; and he preferred not replying to it until his principal had been consulted. The second letter said that Mr. G. Livesey had expressed his approval of the invention. He did not know at the time that Mr. Terrace was then in correspondence with his patent agent. In accordance with Mr. Terrace's request, he (witness) kept the matter quite private. Mr. Walker returned to England in December, when he showed him the correspondence; but he did not know that any opinion on the invention was communicated to Mr. Terrace.

Re-examined: He discussed the matter with Mr. Walker about the 17th or 18th of December.

Mr. *G. Livesey* (whose evidence was taken at this point in order to allow him to attend the Board of Trade Committee on Standards of Light) said that about Nov. 24, 1888, he received a letter from Mr. J. B. Terrace, which he answered and destroyed. It contained a drawing which he returned. It described a method of spur gearing for preserving the horizontality of a gasholder. The drawing was identical with the one produced by Mr. Terrace, if it was not the actual drawing. [Witness's reply was read. He said: "Your plan appears to be just as effective as Mr. Gadd's or mine; possibly yours may be the best of the three."] That referred to Mr. Gadd's 1887 patent. On Nov. 28 he had another letter from Mr. Terrace, in which he said he had submitted it to a patent agent in Glasgow. He recommended Mr. Terrace to apply for provisional protection. At the time he was not aware of Wild's or Standfield's patent, or of the Staindrop gasholder; at any rate, they were not then present to his mind. He recollected rectangular gasholders, and saw a small one at Brighton about ten years ago. It was within a building, and had no guide-framing. As far as he remembered, it was suspended from the centre.

Cross-examined: He had been engaged in gas-works all his life. Up to the time of seeing Mr. Gadd's spiral method of guiding gasholders, he thought it impossible to dispense with guide-framing; for he had himself tried to solve the problem. If it could be done, it would save about 30 per cent. on the outlay for a large gasholder; the cost was about £30 per 1000 cubic feet for the smaller sizes. The South Metropolitan Gas Company were now constructing a very large holder at a cost of £5 per 1000 cubic feet. He knew of Mr. Gadd's 1887 patent in the autumn of 1888; but did not know that Mr. Gadd was working further in the same direction until some time afterwards. Terrace's and Gadd's arrangements were identical. He received many letters—more than he wanted—from inventors, asking his opinion.

Mr. *Terrace* was then recalled, and continued his evidence. He said that prior to Dec. 12, 1888, he had shown the drawings to two of his friends at the gas-works, to his brother Andrew, and to Mr. W. Stewart. His brother was then employed at Brechin; and Mr. Stewart was a clerk in the office. He could not give the exact date; but it was before Nov. 17, on which day he wrote to Messrs. Walker. He thought he showed the correspondence to Mr. Stewart. Messrs. Walker's agent had visited the Brechin Gas-Works during 1887, with the view of getting orders. Personally, he did not know either of the Messrs. Walker. He knew Mr. George Livesey by repute, but not personally. On receiving his reply, he wrote to Mr. E. Hunt, patent agent, of Glasgow, whom he had known before. He also wrote to his brother David, in Glasgow, on Nov. 28, sending him a drawing. The patent was never taken out.

Justice KEKEWICH remarked that a letter to a patent agent would not be a publication.

Examination continued: On Dec. 7 he wrote to Mr. J. Paterson, Warrington, submitting his design with a drawing [produced]. It was a press copy, and was dated Nov. 17, 1888. On the same day he commenced a correspondence with Mr. Gadd. When he received Mr. Gadd's letter on Dec. 11, he knew nothing of what was referred to as his further method. Mr. Gadd returned the drawing sent to him, with a letter, in which he said witness had hit upon the same method as himself, and upon which he had been at work for some months. On Dec. 20 he wrote to Mr. Gadd, saying he had sent a copy of his invention to Mr. Walter King, to see if he would care to publish it in the JOURNAL OF GAS LIGHTING. Mr. Gadd replied on the next day, saying he had been working on his invention for some months, and had obtained legal priority. Further correspondence followed; and in a postscript to one of the letters, Mr. Gadd referred to "torsion" as being treacherous.

Justice KEKEWICK said these letters ought to have been put to Mr. Gadd, if they were to be used to show that he had only torsion in his mind at the time.

Cross-examined by the ATTORNEY-GENERAL: He had been working at this subject for some time; and he wrote to Mr. Gadd and the other Engineers in order to get their opinions. He did not suggest that he had communicated his method to Mr. Gadd before Dec. 12, 1888. He did not remember showing Mr. Gadd's correspondence to his patent agent; he gave up the idea of patenting his invention when he found Mr. Gadd had anticipated him.

Mr. *David Terrace*, Manager of the Middlesbrough Corporation Gas-Works, spoke to receiving a sketch from his brother in November, 1888, when he was at the Dawsholm Gas-Works, Glasgow. He showed it to several persons, and discussed it.

Cross-examined: His brother sent him Mr. Livesey's letter, recommending that provisional protection should be obtained.

Re-examined: He was not aware that there was any secrecy to be observed about the matter.

Mr. *D. M'Kechnie*, foreman at the Dawsholm works, spoke to seeing the sketch sent to the preceding witness, who showed it to him, and read the letter. His opinion was not very favourable to the idea.

Mr. *A. Duncan*, Chemist at the Dawsholm works, also spoke to seeing the sketch, and discussing the matter. He did not give any opinion upon it, not being an engineer. He thoroughly understood it, however, and could see how it worked.

Mr. *A. Smith*, engaged as draughtsman in the Gas Office, Glasgow, said he remembered seeing the sketch in question, when calling at the gas-works. He had a short conversation about it with Mr. David Terrace.

Mr. *A. Terrace* also stated that he had seen a sketch of his brother's invention; it was before his brother wrote to Messrs. Walker, The sketch was copied in the press letter-book; but before this there were several rough sketches which were destroyed. He was then engaged at the Brechin Gas-Works, and knew of the correspondence with Mr. Livesey and Messrs. Walker. He was not very favourably impressed with the invention himself.

Mr. *W. Stewart*, of Arbroath, remembered seeing Mr. Terrace's sketch before the letter was sent to Messrs. Walker. He knew of the correspondence with Mr. Livesey and Mr. Gadd.

Mr. WARMINGTON said there was only one other witness on this point—Mr. James Paterson, of Warrington; but, unfortunately, a telegram had been received saying he was unable to attend. He might have to ask for a commission to take his evidence.

The ATTORNEY-GENERAL said he would save trouble by allowing Mr. Paterson's proof to be read.

Mr. WARMINGTON accordingly read the proof. Mr. Paterson stated that he received a letter and drawing from Mr. J. B. Terrace on Dec. 8, 1888. It lay on his table for some time, and might have been seen; but he did not show it to anyone. His opinion was not very favourable to the invention.

The further hearing of the case was then adjourned till May 3.

Roasting Shelves for Gas-Ovens.—Messrs. Fletcher, Russell, and Co., Limited, write, in reference to the patent for the above, briefly noticed in the JOURNAL last week (p. 621), that the arrangement is identical with one which has been employed for many years in their quick grill, but which they have not adopted in ovens for general use, for the reason that pies, cakes, &c., will not stand level upon it.

The Liverpool City Council and the Electric Light.—The Liverpool City Council last Wednesday adopted a resolution passed by the Watch Committee, to the effect that, having considered the question of using the electric light in lieu of the present mode of lighting the city, they were of opinion that, having regard to the conditions of rapid development to which the system of electric light was now subject, it was not at present advisable to adopt it in the city.

MISCELLANEOUS NEWS.

METROPOLIS GAS SUPPLY.

The Quality of the Gas in the Past Quarter.

The following is an abstract of the report of the Chief Gas Examiner for the Metropolis (Dr. A. W. Williamson, F.R.S.) as to the quality of the gas supplied by The Gaslight and Coke, the Commercial, and the South Metropolitan Companies, during the quarter ending the 31st ult. :—

I. *With respect to Illuminating Power.*—The average illuminating power, in standard sperm candles, at each of the testing-stations, was as follows :—

The Gaslight and Coke Company—	
Fenchurch Street, E.C.	16·2
King Street, E.C.	16·7
Dorset Buildings, E.C.	16·7
Ladbroke Grove, W.	16·4
Devon's Road, E.	16·3
Carlyle Square, Chelsea, S.W.	16·1
Camden Street, N.W.	16·3
George Street, N.W.	16·1
Graham Road, E.	16·5
Kingsland Road, E.	16·4
Spring Gardens, S.W.	16·2
Grove Gardens, St. John's Wood, N.W.	16·1
Hornsey Road, N.	16·5
Lambeth Road, S.E.	16·4
Millbank Street, S.W. (cannel gas)	21·7
Commercial Gas Company—	
Parnell Road, E.	16·2
Wellclose Square, E.	16·2
South Metropolitan Gas Company—	
Hill Street, S.E.	16·5
Bedford Road, S.W.	16·1
Stoney Lane, S.E.	16·3
Lewisham Road, S.E.	16·4
Blackfriars Road, S.E.	16·2
Burrage Road, S.E.	16·0

It will be seen from these results that the average illuminating power at all the stations has been higher than the parliamentary standard of 16 candles, especially at Millbank Street. At this testing-place, and at King Street, the minimum illuminating power was higher than the requirements; while it was equal to them at the Devon's Road, Camden Street, Graham Road, and Kingsland Road stations of The Gaslight and Coke Company, and the Lewisham Road station of the South Metropolitan Company. Slight deficiencies in the illuminating power were returned during the quarter by the official gas examiners at the Fenchurch Street, Spring Gardens, Grove Gardens, Hornsey Road, and George Street stations of The Gaslight and Coke Company; at the two stations of the Commercial Gas Company; and at the Hill Street, Bedford Road, Hornsey Road, and Blackfriars Road stations of the South Metropolitan Gas Company.

II. *As regards Purity.*—Sulphuretted hydrogen was not present in the gas at any of the testing-stations. The average amount of sulphur in other forms than this was considerably less than the quantity permitted—viz., 22 grains per 100 cubic feet—at all the testing-stations. The following excesses by the South Metropolitan Gas Company were returned by the official gas examiners during the quarter :—

Hill Street, Feb. 17	22·9 grains.
Bedford Road, Feb. 3	24·4 "
" " 11	22·5 "
" " 12	24·9 "
" " 15	25·4 "
" " 22	23·3 "
" March 16	30·3 "

With these exceptions, the limit was not exceeded on any occasion during the quarter. Ammonia was generally present in the gas more or less frequently at all the testing-stations; but only in slight quantities. The amount allowed—viz., 4 grains per 100 cubic feet—was not exceeded on any occasion.

THE WEST BROMWICH GAS UNDERTAKING.

Extension of the Gas-Works—The Gas Profits.

Last Wednesday, Mr. Arnold Taylor, one of the Local Government Board Inspectors, held an inquiry at West Bromwich concerning an application made by the Town Council for sanction to borrow £20,000 for the purpose of extending and improving their gas-works. Among those present were the Mayor (Mr. G. Salter), Alderman Farley (Chairman of the Gas Committee), Mr. T. Hudson (Secretary of the Gas Committee), Mr. W. Littlewood (Gas Manager), and Mr. W. Wayte (Outdoor Superintendent), &c. The Town Clerk explained that the population of the borough at the last census was 59,489. The rateable value for the relief of the poor was £191,209; and for the general district rate, £147,530. The outstanding debt on the gas-works was £110,077. It was proposed to erect a new gasholder, the contract for the ironwork amounting to £5335. Then it was estimated that £6000 would be expended in connection with the construction of the tank; making the aggregate £11,335. The other chief items of expenditure proposed were: Additional purifiers, £2640; scrubbers, £600; stoking machinery, £2500; additional boiler, £320; new condensers, £500; coal-testing apparatus, £200. The cost of a new station meter and sulphate of ammonia plant, with other items, brought up the total estimated expenditure to £23,235. The Council had already borrowed and spent £154,620; but under their Provisional Order they could borrow £50,000 more with the consent of the Local Government Board. Since the year 1880, when the West Bromwich Authorities acquired the gas undertaking from the Birmingham Corporation, upwards of £16,400 had been transferred from the profits of the concern to the relief of the borough rates. It was anticipated that the gasholder that was proposed to be erected would provide for the increased consumption for another six years. The price of gas varied from 2s. 3d. to 2s. 8d. per 1000 cubic feet. They had accumulated a working capital out of the profits. Mr. Littlewood was called, and stated that during the winter of 1880-81 the daily consumption of gas was 819,000 cubic feet; but in the winter of 1890-91 it was 1,256,000 cubic feet—an increase of 437,000 cubic feet. For twelve months ending March, 1891, 215,102,000 cubic feet of gas were sent out—an increase of 58,354,000 cubic feet as compared with 1882. The works as completed, were designed to meet a daily consumption of a million cubic feet, estimated upon a yield of 10,000 cubic feet of gas per ton of coal carbonized. The retorts were capable of producing 1¼ million cubic feet of gas per 24 hours; leaving no retorts in reserve in case of accident or continued foggy weather. There was a great necessity for additional producing power. The two gasholders at the works were each capable of only containing 500,000 cubic feet, or 1,000,000 cubic feet in all. The new gasholder would afford additional storeage room for 672,000 cubic feet, and would meet the increasing consumption for the next six years. The sulphate of ammonia plant which it was intended to erect would pay for itself in a very few years. The Committee proposed to make such modification in the retort-house as would enable them to adopt Mr. West's stoking machinery; thus effecting a saving, as compared with hand stoking, of something like £800 a year for the expenditure of £2500. In the course of a discussion with regard to the period over which the repayment of the loan should be extended, the Inspector pointed out that there was a tendency in Parliamentary Committees to shorten the period for the repayment of all loans; and the Local Government Board were bound to follow it. He did not think the Department would grant the loans for more than 30 years. The Town Clerk urged that they should be allowed at least 50 years. Alderman Farley pointed out that Birmingham had long periods for the repayment of their loans, and it placed West Bromwich at a great disadvantage. The Inspector replied that Birmingham borrowed under Special Acts of Parliament. The Town Clerk then asked that the loan should be made repayable over 41 years. The Inspector said he could not hold out any hope that it would be granted for more than 30 years.

At the monthly meeting of the West Bromwich Town Council in the evening, the Gas Committee reported having paid £500 out of the profits of the gas undertaking for the year ending March 31, 1890, to the relief of the rates; and also that they had intimated to the Finance Committee their intention of recommending the Council to transfer £1000 from the profits of the gas business for the year ending March 31, 1892, to the credit of the general district rate fund, to be paid in two half-yearly moieties of £500 each.

RAWMARSH LOCAL BOARD GAS AND WATER SUPPLY.

The Gas and Water Loans—Extensions at the Gas-Works.

Mr. E. P. Burd, one of the Inspectors of the Local Government Board, held a public inquiry at Rawmarsh on the 31st ult., relative to an application by the Local Board for a Provisional Order to amend their Local Acts of 1870 and 1879, to enable them to pay off certain balances of existing gas and water loans, which have been borrowed for short periods and at large rates of interest, and also for extending the period of repayments of other loans. The Clerk (Mr. J. W. Bellamy) explained that the amount it was proposed to borrow, to pay off the loans, was £12,500; and the Board also sought power to increase their capital by £11,000 to enable them to build a new gasholder, a bench of retorts, a residence for the Manager, and other additions at the gas-works. The demand for gas at the present time was so great that the Board were not able to keep pace with it. As to the loans, in consequence of the short periods and the large amount of interest, a considerable amount had each year to be made up out of the general district rate towards the expenses of supplying gas in the district. When the loans were rearranged as proposed, there would be a reduction of the charges on the general district rate, of between £600 and £700 per annum. They suggested that the period over which the repayment of the loans should extend should be 60 years for the gas-works and 50 years for the water undertaking, from the date of the original borrowing; the present terms being from 22 to 30 years. The total indebtedness of the Board was £27,031, of which £17,000 was for the gas, and £10,000 for the water works. They asked for the Provisional Order, because the present Acts were so very contradictory and carelessly framed that the Board were advised the title was not sufficient to enable them to borrow money. Arrangements had been made to take up the loans for the extended period at 3½ per cent.; whereas the Local Board were at present paying as much as 4½ and 5 per cent. Under the Order, they also proposed to take power to sell stock. The estimated cost of the proposed extensions of the gas-works was £7700. In reply to the Inspector, Mr. Bellamy further stated that the maximum charge to consumers of gas was 3s. 3d. per 1000 cubic feet, and 3s. for consumers above 44,500 feet. The maximum charge for water was 7 per cent.; but the charges to consumers at present amounted to 6 per cent., calculated upon the rateable value. He presented a detailed estimate of what was necessary to increase the capital of the Board, saying it was as important to them to increase their capital as it was to rearrange the loans. They had received many applications for gas, including large collieries in the district; and it was necessary to meet these that the Board should at once carry out the extensions at the gas-works. Mr. E. O. Watson, the Manager of the gas-works, said they had 30 retorts; and the average daily make and consumption of gas was 135,000 cubic feet. The consumption was increasing very fast; and he was afraid they would not be able to supply the demand next winter. The proposed new holder was for 200,000 cubic feet, and the present storeage was equal to 100,000 feet. The new holder would be placed on the site of the present works, where there was ample room; and the new bench of 24 retorts would be an easy extension of the existing arrangements. They proposed to erect a sulphate plant, which would cost £1000. He then gave particulars as to the extension and renewal of the gas-mains throughout the district. The majority of the mains had been in the ground 22 or 23

years, and had been found insufficient. They were also much damaged owing to subsidences of the land, which had led to considerable leakages. The mains were purchased about ten years ago from the Rotherham Corporation, who, up to October, 1890, when the new gas-works were opened, supplied Rawmarsh with gas in bulk. The working expenses up to that period had been more than the receipts; and the deficiency had been paid out of the general district rate. They were obliged to charge the maximum price for gas; and had they been able to reduce it, they would have had more consumers, and made a profit. Now they had works of their own, they would be able to make a profit. In 1891 the consumption was between 23 and 24 million cubic feet; and when the district was supplied by Rotherham, it was from 17 to 18 millions. This quantity was taken in bulk; but owing to leakages, arising from subsidences and other causes, the sale was between 15 and 16 million feet. They had had no working capital account; and up to 1891 the general district rate had had to bear a charge of £1394, which included the payment of principal and interest on the £6000 borrowed for the purchase of the mains from the Rotherham Corporation. The new works erected in 1890 had cost £13,000. They did not want to borrow any more money for water-works. The payments for water came to about £790 in the year; but the alterations they proposed to make under the Order, would reduce the amount to £368. With regard to the gas loans, the reductions would be from £361 to £242 in the one case, and from £330 to £263; and from £490 to £300 with regard to the respective loans mentioned. Altogether there would be a difference of from £700 to £800 a year in the annual charge to the rates. There was no opposition to the scheme, and the members of the Local Board were unanimously in its favour. Before the proceedings concluded, the Inspector intimated that the Board ought to have made earlier application, and pointed out that the Order would have to be passed by Parliament, and this might not be done before the end of July.

THE RHYL IMPROVEMENT COMMISSIONERS AND THE GAS-WORKS.

Local Government Board Inquiry.

In the JOURNAL for the 29th ult., we recorded the defeat, by a vote at a public meeting of ratepayers, of the opposition to the proposal of the Rhyl Improvement Commissioners to acquire the gas-works in that town, for which the sanction of the Local Government Board has been sought to the raising of £35,000. This application was recently the subject of an inquiry by Major-General Crozier, when a number of ratepayers again raised objections to the scheme. The Town Clerk (Mr. A. Rowlands) opened the proceedings by giving a history of the Company whose undertaking it is proposed to purchase, down to their application to Parliament last year, when they obtained a Bill in which clauses were inserted enabling the Improvement Commissioners to purchase the works; the price agreed upon being £32,000. To this was added £1400 towards the cost of opposing the Company's Bill; for improvements of the works, £816; and for the Commissioners' costs of opposition, £784—making a total of £35,000. They were now in this position: Parliament had sanctioned the purchase and transfer of the gas-works to the Commissioners, but had made it a condition that the borrowing of the money should be subject to the Local Government Board's sanction. The Gas Company not only did not oppose the Commissioners in their application, but were, by their Act, required to afford all reasonable assistance to them in obtaining sanction to the loan which would be necessary to enable them to carry the terms of agreement into effect. The Commissioners had heard that they were to be opposed by some ratepayers; but all he could say was that those who were taking up a position of opposition were making a terrible mistake. He ventured to assert that Rhyl would never have a better opportunity than the present of making a good bargain. Mr. F. J. Collingwood, the Company's Engineer, then gave evidence. He said the works were capable of producing about 127,000 cubic feet of gas per day, and were economically adapted for producing 25 millions per annum. They cost originally, in 1869, £6092. Of this sum, £3000 was for goodwill and the remainder for plant and land. Since then a sum of £13,775 had been expended upon them on capital account. The number of consumers for the last ten years had remained practically stationary; but there had been a considerable increase in the consumption of gas. Mr. M. R. Partington, the Secretary of the Company, produced the balance-sheets since 1885. He said in that year the price of gas was 4s. 2d. per 1000 cubic feet; the quantity sold being 16,811,766 cubic feet. The net profits were £1937; and the dividend was 10 per cent. Last year the price was 4s.; the quantity of gas sold, 20,519,376 cubic feet; the net profits were £1826; and the dividend was 9½ per cent. The price of gas was reduced, on the 1st of November last, to 3s. 9d. per 1000 cubic feet. The reserve fund in 1890 was £1926; previous to that it was £3229. Mr. S. Perks, J.P., Chairman of the Company, having given evidence in support of the statement that £32,000 was the sum eventually agreed upon for the works, with £1400 towards the costs of opposing the Bill, Mr. Joseph Hepworth, M.Inst.C.E., Gas and Water Engineer of the Carlisle Corporation, was called. He stated that, after careful inquiry, he had come to the conclusion that the sum of £35,000 which the Commissioners proposed to borrow, was sufficient for their immediate purposes. He understood that the gas-works were now producing something like 107,000 cubic feet of gas per day; and Mr. Collingwood had told them that the maximum quantity they were capable of making was 127,000 cubic feet a day, or 25 millions a year. He, however, was of opinion that the works were equal to turning out 160,000 cubic feet per day by simply improving the retorts. On the whole, they were now in good working order. In addition to the gas-making plant, there was also apparatus for the manufacture of sulphate of ammonia. This ought to be valuable. There was sufficient surplus land to permit of further extension of the works, whenever it was found necessary, for many years to come. The price proposed to be paid by the Commissioners for the undertaking was rather less than 20 years' purchase of the Company's profits. This was not only very reasonable, but considerably below what had been recently awarded in the case of the transfer of the undertakings of gas companies to local authorities. What the Commissioners were going to pay for the works was about the value of the undertaking of an unincorporated company. Mr. P. Mostyn Williams, the Chairman of the Committee having charge of the matter, said that, taking Mr. Hepworth's calculation that they could produce gas at 2s. per 1000 cubic feet, they might expect a profit of 1s. 9d. They found that the annual charge at 3 per cent., including the redemption of capital, would be £1359 16s. 6d.; while the profits would be £2187 10s.—leaving a margin of £827 for the reduction of the price of gas, or for lowering the rates. If they based their annual charge at 3½ per cent., it would amount to the sum of £1491 17s. 6d.; and this would leave a margin of £695 12s. 6d. In addition, at the end of 50 years, they would make a present of the works to the town. Thus, while they would be able to work the undertaking at the present time to advantage, they would hand to their successors a concern that would yield them at the very least a profit of £1500 a year. This was the view they took of it as a local authority; and they recommended the ratepayers to adopt it, and the Local Government Board to sanction it. Mr. Cartwright then put before the Inspector, at some length, the views of the opponents of the scheme, who, he said, represented property to the value of £80,000. He maintained that the whole superstructure of the application was based on the foundation that the money could be borrowed for 50 years. Was it, he asked, right or proper that posterity should be taxed for such a period, in a town like Rhyl, over a purchase of this kind. Everybody, he thought, would agree that it was not. He went on to show that, taken on the basis of 30 years, the annual charge would be £2771. As the profits of the gas-works were only £1487, this left a deficit, to be repaid out of the rates, or by an increased price for gas, of £1284 a year. Other speakers having addressed the Inspector in support of the application, the inquiry closed.

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly General Assembly of the Proprietors in this Company was held last Tuesday, at the Offices, St. Helen's Place, Bishopsgate Street, E.C. Mr. GEORGE BANBURY occupied the chair; Mr. A. W. Gadesden (the Chairman of the Company) not being sufficiently recovered from his long illness to preside over the meeting, at which, however, he was present.

The SECRETARY (Mr. I. A. Crookenden) having read the notice convening the meeting, the report and statement of accounts were taken as read. The latter showed that the revenue for the half year ending at Christmas last was £147,301; being an increase of £3137 on that for the corresponding period of 1890, when it was £144,164. The expenditure was £57,664, as compared with £54,443—an advance of £3221. In their report, the Directors said they considered the increase in revenue had been fairly satisfactory; and the extra expenditure they attributed to the higher price of materials and the carrying out of exceptional repairs. The quantity of water pumped in the six months was 8,282,237,730 gallons; being 375,304,578 gallons in excess of that of the corresponding half of the previous year. The new services laid on numbered 1818, against 1620 before; the total being now 172,310. Reference was made to the Bills introduced by the London County Council and the City Corporation with regard to the Water Supply of the Metropolis; and a hope was expressed that these measures would be either withdrawn, or suspended during the inquiry into the whole subject by the Royal Commission. The Directors recommended a dividend at the rate of ⅛ per cent. per annum, the payment of which will absorb £68,810 of the amount available, and leave a balance of £12,566.

The CHAIRMAN, in moving the adoption of the report, said he felt sorry the meeting should be deprived of listening to the Chairman of the Company, whose words would carry far more weight, and would prove more interesting, than those of a substitute. He thought the proprietors would be altogether satisfied with the working of the Company in the past half year, for the Directors proposed to pay a dividend at the rate of 8 per cent. per annum, and carry forward more than £12,000 to the reserve. The receipts would have been a little better had there been the usual returns from road-waterings; but the season was a wet one, and consequently there was a decline in this branch of the revenue. The shareholders might naturally ask how it was that, while there was a falling off under this head, there should be an increase of 375 million gallons in the quantity of water pumped. This arose mainly from there being an extra week brought into account in the half year, which naturally enhanced the total bulk of water pumped, as well as the amount expended on maintenance. They had, in fact, had to deal with 27 weeks against 26 weeks. As regarded the expenditure, the increase was chiefly owing to this extra week, to the higher price of coals, to some special repairs to one of the filter-beds, and to some improvements made at Lea Bridge. They had bidden a final adieu to the Old Ford station; and the concentration of the works at Lea Bridge was an accomplished and successful fact. The three new triple-expansion engines at Lea Bridge were now most satisfactorily performing the duties of their old-fashioned predecessors at Old Ford, which had been sold, and were in process of demolition. The proprietors would be glad to hear that the new engines had more than fulfilled the most sanguine expectations as regarded their pumping capabilities and their economical consumption of fuel. Mainly owing to the knowledge, skill, and forethought of their Engineer (Mr. W. B. Bryan, M.Inst.C.E.), these powerful engines, capable of pumping 36 million gallons of water a day, had been erected and finally set to work without a single mistake or mishap. While rearranging the trunk mains, consequent upon the abandonment of the Old Ford station, they came across a 36-inch main put down about 50 years ago. It was found that the pipe made from the cold-blast iron of those days was of such superior quality that it was most difficult to cut out and make the connection, owing to the toughness of the metal, which was almost as good as wrought iron. He might say that the old pipes were fully equal, if not occasionally superior, to those they now obtained from the best manufacturers under the present system. The Directors had lately acquired 89 acres of

land adjoining the present Walthamstow reservoirs, in order to increase their capacity. With this addition to the present large storeage of 220 acres, they would have a most valuable amount of reservoir capacity to be used as needed. They had arranged that a new pumping-engine was to be erected at Walthamstow, in order to meet the demands of the Essex district, and to improve the supply throughout. With regard to the wells, which must play so prominent a part in the present and future prospects of the Company, he was happy to say that matters looked very cheering, and that these sources of supply had been more successful than the Directors had anticipated. In fact, putting the question of their wells into brief and commercial language, he might say that they had a large amount of liquid assets, with power to add to their number. They still maintained their good character for purity of supply, as testified by Dr. E. Frankland, the Government Analyst, in his last report. He (the Chairman) desired to pay a passing tribute of respect to the memory of Dr. Tidy, who was with the Company for so many years, and knew their case intimately. Dr. Tidy was very distinguished in his profession, and his death was a loss to them and to science generally. The shareholders were aware that for some years past the Company had given a constant supply of water throughout their Metropolitan area, and to 96 per cent. of their country district. This was doubtless very satisfactory from a sanitary point of view, especially in respect of the poorer localities, but not so satisfactory as regarded the revenue, owing to the large amount of waste thereby incurred. The Company really pumped more water than their customers could reasonably require, as they gave them nearly double the supply per head of that afforded in Manchester and Liverpoool. Carelessness, wilful waste, and bad fittings were the causes of this large amount of pumping. They had strengthened their staff of inspectors with a view to saving this waste; and this would practically augment the supply available at the other end. As regarded the Company's parliamentary position, the proprietors were no doubt aware that the Royal Commission on Water Supply had commenced their sittings. He believed that it was not the intention that the Water Companies should be represented by Counsel; and they heard that most probably the inquiry would be held in private. He did not think the Companies had much to apprehend from the Royal Commission. Their case was a sound one; and they now had a fair opportunity of presenting it to a competent and impartial tribunal. The Subways Bill brought forward by the London County Council might have done them considerable harm as it originally stood; but, thanks mainly to Mr. Hollams, they had obtained provisions far more acceptable to the Companies. It would doubtless be remembered that last year the Parliamentary Committee presided over by Sir Matthew White Ridley declared that nothing had been adduced against them which called for any defence on their part, and that the preambles of the Bills brought forward by the London County Council and the Corporation were not proved. Notwithstanding this report of the Committee, which was duly accepted by the House, these Bills, or, rather, two identically the same, had been again brought forward; and that of the County Council was shortly to be read a second time. It did seem hard that, although the Royal Commission was now sitting, the Companies should again be harassed with expensive inquiries, after all the numerous investigations which had already taken place regarding them. In fact, it seemed to some people that the deeds of the London Water Companies were so dark, and their ways so inscrutable, that nothing but annual inquiries could bring them to light. They apparently forgot, however, that the Companies were neither autocrats nor free agents, but that they were very properly and very efficiently controlled at every step by Acts of Parliament and by Government officers; so that all they did was open, legal, and under the direct sanction of officials specially appointed. It was no doubt owing to the confidence in these Acts of Parliament that such large sums of money had been invested in the water undertakings from the days when their prospects were low and their dividends either small or non-existent. This continued commercial confidence in the acts of the Legislature was further shown by the numeroussmall investors who had looked upon water stocks as a first-rate security, and by the fact that nearly one-third of their stock was held by trustees, mainly for widows and children. There seemed to be an impression abroad that they had benefited considerably by the late quinquennial valuation, and that they had thus acquired a large unearned increment; but this was altogether erroneous. In their own case, the rateable value of one-third of the houses had been reduced, in one-third it had been left unaltered, and in one-third it had been augmented by very small amounts. The increase in the quinquennial valuation had fallen not upon houses, but upon corporate bodies, such as dock, railway, and gas and water companies. From this, of course, they derived no benefit whatever. The proprietors might not, perhaps, be aware of it, but the rateable value of numerous properties in their district was so small that they were furnishing supplies to the poorer tenements at an actual loss. This sounded as if they were doing something philanthropic; but, of course, it was all in the day's march, and they must take the bad with the good. With regard to the Company's staff, both in the office and in the district they worked diligently and successfully. Mr. Bryan maintained his pre-eminently high reputation as an engineer, and did so much for them that he (the speaker) sometimes feared for his health. They knew Mr. Bryan's value, however, and took great care of him. Their Secretary was a very good administrator, and had the knack of smoothing over any difficulties that might arise with the consumers; and when he (the Chairman) told them that their customers numbered nearly a million and a quarter, and that complaints and summonses were of rare occurrence, he thought they might safely assert that they exercised with consideration and moderation the powers which had been given to them by the State. He might say that the condition of the works was excellent, and the intrinsic value of their property higher than it had ever been. He saw no cause for apprehension as to the future; and they must remember that not only had every water undertaking which had hitherto been acquired been purchased upon a fair and just basis, but also that this same course was recommended last year by the Select Committee in regard to the London Companies. Only the other day, the *Daily News*, in a leading article, advised that the London water-works should be bought at a fair price. They might also feel reassured when they remembered that the final decision of the question rested with Parliament.

Mr. F. TENDRON, in seconding the motion, said they had met to consider the work carried on by them during the past half year, which had been attended with very satisfactory results; but at the same time, he did not suppose that any gentleman present had entered the room without feeling that it was a source of extreme unpleasantness to know that the market value of his property had so greatly depreciated during the last few months. This might not be a proper subject for discussion at their meeting; but it was well if anything could be said which should to a certain extent disabuse the minds of the proprietors that their property had fallen in any way in its intrinsic value. A most mischievous speech was made not long ago at the London County Council; and he could not understand how a man of the position of Sir Thomas Farrer could rejoice over the depreciation of stocks held by those who had put their money not in casinos, in places of public entertainment, or in beer, but in one of the first essentials of life, being thus general benefactors. He said most plainly that it was the sentiment of an anarchist—a man who hated property—which animated those who were enemies to order and enemies to confidence in just rights. The Water Companies were carrying on their business not by any violation of rights, but in accordance with the powers conferred upon them by Parliament; and, as the Chairman had said, they were under control, and could never do a single thing for which they were not amenable to justice and to the public if it were wrong. If they made any mistake, the newspapers, unfortunately, made the very most of it; and they seemed to triumph over any indiscretion on the part of any one of the numerous servants employed by the Water Companies. As to the fall in their stocks, the intrinsic value of their property could never be shaken, for it was not a question of the capital value of their undertaking, but of the income they were earning; and if there was to be respect for property and for law, it was impossible that the property of the Water Companies could be taken by force without giving every shareholder the income he was then enjoying. If his property were taken from him, it would be for what was called the public good. No Parliament would dare to say that they took it in order that the ratepayers might pay less. It must therefore be taken for the public good; and if so, it could not be said that the shareholders should lose by such a proceeding. They must give the shareholder the income he was receiving, and also something for what he had done with respect to the future. Therefore, he maintained that, intrinsically, their property could never be taken from them by force at a less value than that which they were receiving at the time it was taken. What could be done, however, was that shareholders might be harassed and made uneasy; and their property might thus be made to fall in value, and they themselves be alarmed into accepting terms. Of course, if either Directors or shareholders were weak, and would accept less than they were entitled to, Parliament had nothing to do with it. He maintained that, if any negotiations were entered into at any time, it should be on the basis he had indicated. If not, they were in the hands of Parliament, who would not take the responsibility of removing their property from them without their consent without giving them the income they were receiving at the time. He hoped that the shareholders would watch the proceedings of the Royal Commission, and the introduction of any Bills into Parliament.

Mr. ROKEBY PRICE said he thoroughly appreciated the speech which had been made from the chair; and he felt sure that their interests were safe in the hands of the Directors. With reference to the valuable remarks which had been made by the last speaker, he thought it was right that a protest should be made against the wilful and shameful depreciation which had been made in the stocks of the Water Companies. There was no doubt that this was owing to what had taken place at the London County Council, and to the high position which Sir Thomas Farrer held in the world. Had the remarks made by that gentleman emanated from a person of less consequence, it would not have mattered; but for such a man to have made the speech he did, almost surpassed belief. The Chairman had referred to their doing something philanthropic in connection with their supplies to poor tenements; but was it not rather unwise to supply their water at a loss? It was difficult to draw the line as to who was to have charity and who not, and it might be said that they felt that they did not give sufficient accommodation to their poorer customers, and that therefore they made them no charge.

The CHAIRMAN, in reply, stated that, with regard to their supplying certain houses at a loss, they were bound by the Act to do so. They however, got the benefit of those houses that were of a higher rateable value. It happened in their district that there were so many poor tene ments that, when the rating fell below a certain value, the collections from them were so small that they did not pay them for furnishing the water. Of course,they benefited by the better class of houses; and that was part of the whole scheme—just as a house in Belgrave Square was rated higher than one at Hackney. With reference to the fall in the market value of their stock, he thought it might be owing to some apprehension as to the mode in which any question of purchase might be proposed. The market was also very sensitive, and there were not many buyers; but anyone wishing to buy, he thought, would have to give a great deal more than the price now quoted, for any stock that he purchased.

The resolution was then carried unanimously.

On the motion of Mr. G. ILSLEY, seconded by Mr. ROKEBY PRICE, the retiring Directors (Messrs. H. Barnard and R. B. Fenwick and Captain Hugh Davis) were re-elected; and subsequently the retiring Auditor (Mr. Walter Bird) was also re-appointed.

The CHAIRMAN afterwards proposed, and Mr. TENDRON seconded, a cordial vote of thanks to the Engineer (Mr. Bryan), the Secretary, and the staff.

The SECRETARY, in acknowledging the resolution, stated that Mr. Bryan and himself acted together with the greatest unanimity; and they felt that no matter what questions might arise, or what form any inquiry might take, they would be quite prepared in their respective departments to put before a Commission, or anyone else, a statement which would be highly creditable to their Company.

A vote of thanks was afterwards passed to the Chairman, and also to the Directors.

The CHAIRMAN, in reply, assured the shareholders again that the Company had a strong case; and they might rely upon it that the Directors would do their utmost to protect them. He then went on to say that, from what one could gather from the Press, the public feeling towards the Water Companies was something to this effect: We have grumbled at you, and we have used very uncomplimentary language towards you; but, on the whole, you have served us well, you have acted up to the requirements of the day, and you have readily carried out the orders and suggestions of Government. But the prevalent opinion now is that you are out of date, and must give way to some municipal body. We have no desire to deal hardly or unfairly with you in the matter of purchase, as we remember that, by your energy and your enterprise, you have constructed from small beginnings the present gigantic system of satisfactorily supplying 5 million people with 200 million gallons per day, and have, as the *Morning Post* says, rendered London "one of the healthiest cities in the world, especially free from diseases arising from consumption of polluted water."

The proceedings then terminated.

THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

At the Meeting of the London County Council on the 29th ult., Sir Thomas Farrer took the opportunity of reviewing the position of the Council, which had just been re-constituted, with regard to the Metropolitan Water Question. He said the effect of the late election was excellent; showing as it did that the ratepayers honestly approved of the entire policy of the previous Council. Turning to the effect of that election upon the shares of the Water Companies, he said they had fallen from 2½ to 17½ per cent., the average depreciation being from 8 to 10 per cent. Practical unanimity existed in London upon this subject; and all parties were forced to adopt the Council's policy. The Progressives were unanimous; and he believed the Moderate section had raised no objections. The Council would therefore lose character if they did not do their best to realize the ends they had in view. But this was no easy matter; for the difficulties in the way were considerable. The sources of the future supply of London had not been determined; and it was obvious that the Home Counties would have much to say on the subject. Certain assumed rights of the present Companies would be disputed to the death—and that, too, with a great deal of justice; and it would be madness to purchase these supposed rights without the fullest investigation. The position of the counties affected would have to be considered; and the legal powers of the Companies with reference to their charges must be inquired into. Serious doubts existed as to the legality of the present charges; but the Council had yet no power to ask the Companies a single question, to examine their books, or to get information from them. The hands of the Council were tied; and they had no means of ascertaining the facts. They had applied for the necessary power; but Mr. Ritchie made it a condition of proceeding with the Bill that this clause should be struck out. This was an example of the fairness of the Government towards that Council. He did not blame the Government, because the members representing London did not enforce the views of their constituents and of the Council, as he hoped they would do after the next general election. There were also the questions of a constant supply and the increase of the Companies' rates and dividends; and he thought he had stated enough to show what a very little way they had got in the investigation of the water supply. The foregoing remarks attracted considerable attention; and, as will be seen by the report of the proceedings at the meeting of the East London Water Company which appears on the preceding page, as also by the remarks of Colonel Makins in the House of Commons last Thursday, given in our "Parliamentary Intelligence," they drew upon their author some adverse criticism. At the meeting of the Council last Tuesday, it was agreed, on the recommendation of the General Purposes Committee, as follows: "The Special Committee shall prosecute and conduct all needful inquiries and negotiations relative to the supply of water, or to companies supplying water, in or near London, and shall consider the steps to be taken for acquiring the undertakings now supplying London, or for providing a new supply. The Committee shall conduct any negotiations with the Water Companies, for purchase or otherwise, which may be authorized by the Council. The Committee shall take the necessary steps for the purpose of promoting and conducting, conjointly with the Corporation of London, the Water Bill of the Council; and the Committee shall conduct the case of the Council before the Royal Commission appointed to inquire into the subject of the London Water Supply."

KIMBERLEY WATER-WORKS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Wednesday, at the Cannon Street Hotel, E.C.—Mr. A. J. MACDONALD in the chair.

The SECRETARY (Mr. W. Vincent) read the notice convening the meeting; and it was agreed to take as read the report and accounts, a few figures from which were given in the JOURNAL last week.

The CHAIRMAN said the past year had again showed a considerable decrease in the consumption of water. This was attributable almost entirely to the very unusual rainfall, which furnished both the towns and mines with water which the Company would otherwise have supplied. As to the working expenditure, this had diminished; and the Manager believed it would continue. Besides this the cost of fuel used for pumping might be considerably reduced when the new railway between Kimberley and Bloemfontein was finished. Although the dividend recommended this year was low, he thought he could safely say they had now reached the bottom point; and they might look forward even this year to an increased consumption of water. He then quoted some statistics which had been collected with regard to the rainfall during the past few years. In 1891, the rainfall was 31·1 inches, which was as much as fell in England. The average rainfall of Kimberley and the district was 17·5 inches. Respecting the diminution in the working expenditure, it was interesting to see that in almost every item they had a reduction. The difference in salaries and wages at the Kimberley office and stations had not been very much—£8700, as against £8590; but there was a large decrease in the cost of pumping, owing to there having been a smaller quantity of water consumed (£6400, as compared with £10,651). The maintenance repairs were £2689, against £3000; and the carriage and transport was £983, compared with £1100. Altogether the expenditure showed a diminution of £5700. Their Manager estimated that the relative gain in the total expenditure would be about £2600. The London charges had also been reduced. Proceeding, the Chairman said he had taken the trouble to work out the total amount of dividend that had been paid by the Company; and the figures were really surprising. Including 1891, the total sum paid as dividend was £217,175; and the depreciation written off was £82,810—making together about £300,000 in ten years. Considering the opposition and difficulties the Company had had to contend with, he thought this was not a bad statement. The two last years had been the worst they had had; and in those they had only been able to pay a dividend of 5 per cent. Having pointed out that in the first three months of the current year, there had been a substantial increase in the consumption of water, he concluded by moving the adoption of the report and accounts, and the declaration of a dividend of 5 per cent.

The SECRETARY then read a report which had been received that morning from Mr. D. Macdonald, one of the Directors, who had gone out to Kimberley to inspect the works. He stated that these were in good order; and that the prospects of the Company were very encouraging.

Mr. G. F. SMITH seconded the motion.

A long discussion ensued, in the course of which one shareholder stated that ever since the Company had bought out the Griqualand Public Works Company, the profits had been diminishing. Another proprietor thought the reduction of the profits was due to three causes: (1) The permanent reduction of the tariffs which had been forced upon the Company from time to time; (2) the bad business, which had been general, throughout the mining districts; and (3) the very wet seasons. A shareholder elicited from the Chairman that the fees of the Board amounted to £2000 a year; and this led to two or three gentlemen expressing the opinion that, while the dividends were as low as at present, the Directors ought to be contented with £1000.

The motion was carried *nem con.*

The retiring Directors and Auditors were re-elected; and the proceedings then terminated.

NOTTINGHAM CORPORATION WATER PROVISIONAL ORDER.

The Water Supply of West Bridgford.

A Local Government Board Inquiry was held at Nottingham last Tuesday, by Mr. ADRIAN, one of the Inspectors, into an application by the Nottingham Town Council for a Provisional Order to vary, repeal, alter, and amend their Water Act of 1879, so as to provide that the limits of the water supply, as defined by section 3, might be extended to include the district of West Bridgford. There was a strong opposition by certain ratepayers, who objected to the confirmation of the Order.

The TOWN CLERK (Mr. S. G. Johnson) and Mr. HARRIS appeared for the Corporation; and Mr. APPLETON for the West Bridgford Local Board, in support of the application. Mr. DALY represented the opposing ratepayers.

The TOWN CLERK, in opening the proceedings, referred to the reasons which had induced the Corporation to ask the Local Government Board to amend a section of the local Act of 1879. The early supply of water to the borough and the surrounding district was by a private Company; but in 1879 the Corporation purchased the undertaking. There were many large and populous districts in the vicinity of Nottingham; and some of these places were supplied with water at the same rate as the burgesses. Other places which had been added since 1879 had not been so supplied; but had been charged a differential rate from those originally included, for very sufficient reasons. The water which the Corporation of Nottingham supplied was not a gravitation or surface supply; but it was reputed to be one of the best supplies to be found in the kingdom. In 1882, the Corporation agreed to supply West Bridgford; and they extended their works and mains at considerable expense. From time to time deputations from the parish waited upon the Corporation asking for a reduction of the differential rate; and in 1888 the Water Committee placed them upon the same terms as other outside places. The parish continued to grow; and the Corporation, after expending about £2500 in the works necessary for supplying the increased demand, thought it was time they were placed in a more secure position. A Local Board was afterwards established; and the Corporation approached them on the subject. The result was that a provisional agreement was drawn up between the Corporation and the Board; and he considered the latter obtained extraordinarily good and liberal terms—terms which bound the Corporation to supply water to them in perpetuity if they so desired; while, on the other hand, the agreement gave the Board the opportunity at any moment they liked to terminate the contract. Had the Corporation known the kind of treatment they were going to receive from West Bridgford, they would never have undertaken to supply them with a gallon of water. By the provisional agreement, the Corporation were to continue to supply West Bridgford with water at a differential rate of 25 per cent.; and the Board were to be clear of any management expenses. This was a clever agreement on the side of the Board; but it was somewhat detrimental to the Corporation.

Mr. APPLETON said the Local Board had come to the conclusion that the agreement which they had made with the Corporation was the best that could be secured in the interests of the ratepayers. It was obvious that a small parish of 2500 inhabitants, in setting to work to obtain a supply of their own, would be under a great disadvantage, and that was the reason the Board had entered into this contract. Roughly speaking, if they provided an independent water supply, there would be a loss on the year's receipts over expenditure of from £400 to £500 a year.

Witnesses were then called, on behalf of the Local Board, in support of the Order—one of them (Mr. J. Rushworth) stating that, at the lowest

possible figure, it would cost £13,050 to construct works for the parish; and he calculated that about £500 would be lost on the undertaking, which would have to be taken out of the rates.

Mr. DALY argued that, in the interests of West Bridgford, the Nottingham water ought not to be forced upon the ratepayers. Briefly, they opposed the Order on these grounds: (1) Because good water in equal abundance could be obtained in West Bridgford; (2) and at a cheaper rate than from the Nottingham Corporation; (3) that local control of the water supply was desirable; (4) that the majority of the ratepayers of West Bridgford desired to secure a local supply; and (5) that the majority (of one) on the Local Board did not represent the majority of the ratepayers on this question. He believed that they could supply the water for themselves at 20 per cent. less than the price at which they were served by Nottingham.

Evidence was then called on behalf of the opposition.

Mr. *W. H. Radford* said he had been consulted by certain gentlemen at West Bridgford with respect to the supply of water. Boring operations were carried on under his directions; and he found a very good supply of water—far beyond the requirements of West Bridgford. The cost of establishing works would be about £7000. The working expenses he estimated at £250 a year; and the sinking fund would be about £385. He denied the accuracy of Mr. Rushworth's figures; but said that, even on those figures, he would strongly recommend the adoption of the scheme.

Dr. *Percy F. Frankland* deposed that the water taken from the trial boreholes at West Bridgford was very suitable for drinking purposes; but it was unfortunately rather hard, although the hardness was not so great as that of the water supplied by the Kent Company to a part of London.

Mr. *Matthew Doubleday* stated that a memorial was in course of preparation to the Local Government Board in opposition to the Provisional Order; and it already contained 318 signatures of owners and occupiers. The syndicate formed for carrying out the boring for water included 48 persons; and they raised money by subscription amounting to £149. If the Local Board were not prepared to undertake the water supply, the syndicate would. It was estimated that they could supply the district with water at 20 per cent. less than Nottingham.

Other evidence of a similar character was given.

Mr. JOHNSON and Mr. APPLETON having replied, the proceedings terminated.

Shanghai Water-Works Company.—A balance dividend of £1 2s. 6d. per share is announced by the Directors; making, with the interim dividend already paid, a total of £1 14s. 6d. for the year 1891.

Extensions at the Leeds Corporation Gas-Works.—At a meeting of the Gas Committee of the Leeds Corporation last Friday week, it was agreed that the manufacturing plant at the Meadow Lane works should be extended, and that a gasholder should be erected on vacant land in Dewsbury Road.

Stoppage of a Gas-Works.—An unusual occurrence is reported from Weardale. Owing to the high price of coal in that town (23s. per ton), the gas-works at St. John's Chapel have been closed till further notice. There will now be no light for the Town Hall and places of worship except by oil-lamps.

Southampton Corporation Water Supply.—According to a report presented at the last meeting of the Southampton Town Council by the Water Engineer (Mr. W. Matthews), on the operations of the Water Department during 1891, the total quantity of water pumped was 830,500,000 gallons, as against 805,500,000 gallons in 1890; the cost of pumping was £2219, as compared with £2102; and the total working expenses were £4487, as against £4339.

Tipton Local Board Gas Supply.—At the last monthly meeting of the Tipton Local Board, the Gas Committee reported that, during the year ending the 25th ult., 96,778,000 cubic feet of gas had been made; being an increase of 10,066,929 cubic feet on the previous year. A vote of thanks was accorded to the Manager (Mr. Vincent Hughes), for the foresight exercised by him in providing a sufficient quantity of coal to meet all requirements during the recent crisis. The report was adopted.

Proposed Purchase of the Wrexham Electric Lighting Works by the Corporation.—It having come to the knowledge of the Wrexham Town Council that the local Electrical Company would not be unwilling to sell all their interest in the undertaking, Alderman Jones, at a recent meeting of the Council, moved a resolution expressing the opinion that it was desirable to become possessed of such a property, and instructing the Town Clerk to write to the Company inquiring at what price the purchase might be made. In support of his motion, the Alderman said the growth of electric lighting had been remarkable, as was shown by the fact that one London Company in 1889 had 6000 lamps, and in 1891 60,000; while another in 1889 had 11,000 lamps, and in the next year 25,000. Much, too, he believed, was expected from the discovery that electricity could be used for cooking. The Mayor (Mr. F. W. Soames) seconded the motion, which was carried.

The Dangers of Paraffin and Spirit Lamps.—One of several fires which occurred in Liverpool at the close of the week ending on the 2nd inst. took place in the upper room of a house in a court in Great Howard Street. On the arrival of the police with fire-extinguishing appliances, they heard that two children were in the burning room, and two constables bravely entered the apartment and brought out the children, aged seven and five respectively. They were dead, the bodies being fearfully burnt. The parents had gone out—leaving the children in bed; and the fire is supposed to have had its origin in an accident to the paraffin lamp left burning in the room. A fire occurred half an hour after midnight last Tuesday morning at 14, Albert Road, North Woolwich, in a private house occupied by Patrick O'Connor, a gas stoker. A spirit-lamp was accidentally upset in the back bed-room on the first floor, and O'Connor, his wife, and a child became overcome with the flames and smoke. A police sergeant and two constables did good work in rescuing the unfortunate people, but not until Mrs. O'Connor had been so badly burnt as to necessitate her removal to the nearest hospital. The premises were considerably damaged.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Glasgow Town Council on Thursday resolved to purchase the land, buildings, and plant of the Glasgow Alum and Ammonia Company at the price of £9000, and to take over the stock and moveable plant at a valuation. The Company is in liquidation, and its works have been advertised in the JOURNAL and elsewhere as for sale by public auction. The works adjoin the Tradeston Gas-Works; and when the offer of Mr. T. M'Lintock, the Liquidator, was submitted to the Gas Committee on Wednesday, they were unanimously of opinion that the acquisition of them would be of great advantage to the Corporation. At their Dawsholm works they have abundance of space; and the residuals are treated on the spot. At the Tradeston works, space is limited; and were it for nothing else, the land which they acquire by the purchase is valuable. But in addition to prospective uses, the works will enable them to have the treatment of residuals carried on upon the spot under the most favourable conditions. In recommending the purchase of the works to the Town Council, Mr. Ure said he thought it was a question of policy as well as cheapness. He considered the purchase was at a cheap rate—£2 per yard, whereas the Cleansing Committee had paid £2 10s. per yard for ground in the neighbourhood without any works at all. In the interests of the Gas Trust, it was necessary that they should acquire these works; but they would not be used, as at present, as alum and ammonia works except in a case of emergency. The purchase is a most fortunate one for the Corporation; and the Gas Committee deserve congratulations for their prescience and tact in carrying it through.

It goes without saying that there are people on all public bodies who are not up to date; one of these is Mr. Starke, a Glasgow councillor. When the amount of the gas revenue for the portion of the financial year which has expired was reported to the Town Council to have been £287,126, he wanted an explanation as to how it came about that it was £47,621 above the amount at the same period last year. Poor man, he must surely have been asleep while the recent annexation scheme was being carried through. The explanation given by Mr. Ure, the Convener of the Gas Committee, was short, but to the point; and it was that they had acquired the gas-works of Maryhill, Pollokshaws, and Dalmuir.

The electric lighting venture of the Glasgow Town Council was considerably advanced at their meeting on Thursday. Acting on the recommendation of the Gas and Electric Lighting Committee, they fixed the charge for electricity at 7d. per unit to all customers; and several contracts for furnishings in connection with the central station in Waterloo Street were let. The supply of engines, dynamos, &c., has been entrusted to Messrs. Latimer Clark, Muirhead, and Co., of London, at a cost of £10,900. The London firm was selected on the recommendation of Professor Kennedy, as being the most successful makers of engines for electric light installations. The contract for the supply of cast-iron troughs, covers, service-houses, &c., has been secured by Messrs. Robert Maclaren and Co., of the Eglinton Iron-Works; and for the supply of boilers, by Messrs. Lindsay, Burnet, and Co., both Glasgow firms. Some little cavil having been expressed at the Committee's sending work to London when there was so much engineering in Glasgow, the Council were assured by Mr. Ure that five-sixths of the work would be done in Glasgow. It is the intention of the Corporation to proceed at once with the work of introducing the plant; and it is the desire of the Committee that the lighting of a number of the streets by electricity shall be in operation in November next. They propose to start with a series of streets in the form of a cross, with a long tail to one of the legs. One of the lines will be from the Cross along the Trongate and Argyle Street; and the other will start at Broomielaw Bridge, proceed up Jamaica Street, at the top of which it crosses Argyle Street, and will then go up the hill by Union and Renfield Streets to Sauchiehall Street, along which it will be turned at right angles, and the whole of that street, to its further end at Charing Cross, will be lighted. Sauchiehall Street is a mile and a half long; and it is proposed to place 20 arc lamps in the thoroughfare, which will provide a lamp for every 132 yards, or, the lamps being on alternate sides, 264 yards will intervene between the lamps on any particular side of the street. This cannot be said to be overdoing the matter of lighting.

An important letter from the Secretary to the Board of Trade has been submitted to the Glasgow Gas and Electric Lighting Committee, to the effect that the Board propose to limit their approval of the high-pressure system of the supply of electricity to one year. This shows that the Board of Trade are but feeling their way in the matter of electric lighting—a circumstance which should make corporations cautious in adopting the high-pressure system; because, should the Board make up its mind the other way, high-pressure plant might suddenly be thrown out of use.

The Edinburgh Merchants' Association—the body whom I mentioned some weeks ago as having employed Dr. Ivison Macadam to analyze the Edinburgh and Leith gas, with a view to backing them up in the belief that the gas, was bad, but who, on obtaining a report from Dr. Macadam that the gas was of good quality, changed their tune—had the matter before them again on Wednesday night. Having sent Dr. Macadam's report to a Committee, the Committee appointed Mr. J. M. Turnbull, one of their number, to prepare a report on the whole subject. Mr. Turnbull is a chemist, with a good theoretical knowledge of gas manufacture; and he produced an exhaustive report which is to be printed and circulated before adoption. He brought out that the present high price of gas—4s. 6d. per 1000 cubic feet—is owing to too high a price being paid for the gas undertakings, by which a burden is entailed of 7½d. per 1000 cubic feet on the gas consumption, and to the high price of coal, which has advanced from an average of 12s. per ton in 1889 to 20s. per ton in 1892. In connection with the latter, he condemned the existing system of contracting for coal as being behind the age. The coalmaster, he said, not knowing what changes might ensue, puts on 15 to 20 per cent. to cover his risks. He therefore advocated that a store of coal to last six weeks or two months should be laid in; and that then contracts should be either abolished or reduced to one or two months. The rise in the price of coal, he showed, had in one year put £42,000 into the pockets

of the coalowners; and he believed that very little of that sum went to the miners. In order to avoid paying such a high price for coal, he strongly advocated the reduction of the illuminating power of the gas from 26 to 22 candles, by which the price might be reduced to 3s. or 3s. 3d. per 1000 cubic feet. He deprecated the proposed expenditure of £44,000 upon additions to the Edinburgh works, and favoured the extensions being made to the Leith works, or preferably, that new works should be erected either upon a site to be reclaimed from the sea between Leith and Portobello, or upon land in the same neighbourhood which is known as the Craigentinny irrigated meadows. His most important suggestion was that the Gas Commissioners should introduce the oxygen system of gas purification, which Mr. W. A. Valon, Assoc.M.Inst.C.E., of Ramsgate, has done so much to bring forward. By its use, he maintained, a saving of 2d. per 1000 cubic feet of gas would be attained, the saving being made up of a revenue of £5208 in the increased illuminating power of two candles, and of £4683 less being spent on coal. The Committee recommended that a petition in terms of the report should be presented to the Gas Commissioners; and also that the Commissioners should be asked to recommend to consumers the burners which would be suitable for producing the best results from the gas supplied. The members received the report very favourably; but, as stated above, resolved to take a month to consider it. The report is welcome as containing a criticism by an outsider upon the policy of the gas undertaking. It is an easy matter to criticize; the value of the criticism is quite a different matter. If all criticism were couched in as respectful a tone as Mr. Turnbull's, and were as generally intelligent, it would be an easy matter to deal with it; and there is no doubt that when this document reaches the Gas Commissioners, it will receive every consideration. If I were to criticize Mr. Turnbull's views, I should say that no one can take exception to his proposals to reduce the illuminating power except on the ground that the Commissioners are about to experiment on the enrichment of gas by oil, of which he is probably not aware. Neither can exception be taken to his proposal to introduce oxygen purification, unless it may be that he seems to proceed on the assumption that the Engineers to the Gas Commissioners have not applied their minds to it, which can hardly be the case. On the subject of coal contracts, he was not so sound. A much larger store than two months' supply would be necessary to enable the Commissioners to abolish coal contracts; while one or two month contracts might be expected to give admirable facilities for the formation of rings and corners among coalowners. The question is, however, a debateable one. He was altogether wrong in the proposals as to a new site for the gas-works. To carry out such a scheme would mean an addition to the price of gas; and it cannot be thought of till more propitious times arrive. Meanwhile, the Commissioners must stick to the works they have and make the most of them.

Passing from Mr. Turnbull's report, there was quite a refreshing little incident in a short statement which the Chairman made. The Chairman was one of the guests at the annual dinner of the Gas Commissioners, which was held in private in the middle of last month; and though he did not disclose what went on there, he said that if he had had occasion he would have borne out every word that the Lord Provost said regarding electric lighting. His Lordship spoke of the electric light engineers who promised them everything, and of the people who hoped for everything from the electric light. He (the Chairman) could have come in as a *savant*. On a recent occasion, on opening a new warehouse in Bradford, seeing that the Corporation had brought out the electric light, he thought he would be abreast of the age, and he introduced it. He was paying three times for electric light in the one warehouse what he was paying for gas in the other in Bradford. The 200-candle power lamps were costing him 4d. per lamp per hour; the 100-candle lamps, 2¼d. per lamp per hour; and the smaller lamps, 4d. each per 14 hours. He expected to have a pretty sum to pay at the end of the winter six months. He granted that they had a most beautiful light, and everything was clean; but if the difference in price were put before the citizens of Edinburgh, they would not adopt it. Subsequently, Mr. Turnbull said he had calculated out the Chairman's figures; and he found that, light for light, the cost was as 1½d. or 1⅝d. for gas to 4d. for electric light. This from Bradford, the great pioneer of corporation electric lighting, is very instructive; as it points to the probability that, when the three-year contracts with customers expire, there will be a general return to gas, and the vaunted profit on electric lighting will then disappear.

West's patent coal breaking and stoking machinery, which has been fitted up in the Aberdeen Corporation Gas-Works, was formally taken off Mr. West's hands by the Town Council on Monday. It was stated that, whereas it previously took ten minutes to draw and charge a retort, 18 retorts could now be dealt with in that time. The estimated cost of the plant was £6000, and the actual cost had been £6244. Of this sum only £1513 had been charged to capital. There are two sets of machines, worked by the overhead wire-rope system. A report by Mr. A. Smith, the Manager, showed that during October, November, and December the quanity of coal carbonized was 1300 tons more than in the same period of the previous winter, and that the cost of the working was £600 less. The saving of cost was at the rate of 1s. 0¼d. per ton; and upon a gross yearly quantity carbonized of 40,000 tons, the saving by the machinery is expected to be £2000. If that is realized in working, the plant will repay its cost in three years.

The Dundee Gas Commission last Wednesday, acting on the advice of Mr. M'Crae, the Manager, resolved to advertise for a supply of coal for six months, so that it would seem they are inclined to adopt a short-contract system. Other stores are to be contracted for for twelve months. The Commission also approved of Mr. M'Crae's proposals, already referred to in these "Notes," for the execution of alterations and extensions at the gas-works.

There was another lively meeting of the Dunbar Gas Commissioners on Monday night; some of the members complaining that they did not get notice to attend the inspection of the gas-works which Mr. Foulis, of Glasgow, recently carried out. It was explained that Mr. Foulis's visit was intended to be of the nature of a surprise one; and thereafter the talk descended into twaddle about who had communicated an account of Mr. Foulis's visit to the *Glasgow Herald*. It is difficult to say what is at the bottom of all the hubbub; but one thing is certain, that while the members of the Corporation wrangle over such small matters as this, the work of the gas-works cannot be efficiently carried out. Mr. Foulis, it appears, directed that a record of weights, &c., should be kept; and meantime he declined to make a report on the working of the undertaking.

The attempt by the Board of Supervision to interfere with the working of the Fraserburgh Gas Company's works, mentioned in my last week's "Notes," has not been long in being disposed of. The medical officer whom the Police Commissioners asked to report on the works has reported that, in his opinion, they are not conducted so as to be a nuisance in the sense of being prejudicial to public health. It is true that the Board of Supervision may yet send a special officer from Edinburgh to examine the works and report direct to themselves; but if they had been going to take that step, it is likely they would have done it at first.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April 9*.

Sulphate of Ammonia.—The market is entirely without change; and the finer weather has not stimulated the demand to any great extent. Consumers are pressing for their deliveries; and there are a few fresh orders. But on the whole the state of trade is disappointing, and not at all what it should be. The worst feature of the situation is that the slackness of demand impresses buyers with the idea that they must be able to buy sulphate at their own prices, though they are quickly disillusioned when it comes to actual business. Quotations remain unchanged; and as there is little offering, there seems to exist no danger of lower prices in the near future. Nitrate is weak; but still prices of good qualities have given way very little, and 9s. to 9s. 1½d. is quoted. Sulphate is £10 5s. at Hull, £10 3s. 9d. at Leith, and £10 2s. 6d. at Liverpool.

LONDON, *April 9*.

Tar Products.—There is absolutely no new business being done in this market; and sellers are becoming extremely anxious as their stocks are going on increasing. Even pitch, which was a sort of backbone to the trade, is participating in the weakness which characterizes all other products. Low prices are reported in several instances where tar contracts have been received. In one case where tar is extremely bad, as low as 10s. has been accepted. The following prices must be considered only nominal, with the exception of tar: Tar, 10s. to 12s. 6d. Pitch, 29s. 6d. Anthracene, 30 per cent., "A" quality, 10½d.; "B," 7½d. Benzol, 90 per cent., 1s. 10d.; 50 per cent., 1s. 6d. Toluol, 1s. 4d. Solvent naphtha, 1s. 3d. Crude benzol naphtha, 30 per cent., 10½d. Creosote, ¾d. Naphthalene salts, 20s.; pressed, 45s. Carbolic acid, crude, 60's, 1s.; 70's, 1s. 4d.; crystals, 4¾d. Cresol, 8d.

Sulphate of Ammonia.—A little better feeling has imported itself into this market; and it looks as if sulphate has taken a turn for the better. More inquiry obtains, and there is just a shade of improvement in values. Business is reported as having been done as low as £10, less 3½ per cent.; but £10 2s. 6d. or £10 3s. 9d. may be taken as a fair average value. Gas liquor (10-oz.) is nominally priced at 5s. to 6s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The coal trade of this district has again relapsed into a very quiet condition; and, with very few of the collieries working more than five days per week, stocks are accumulating, especially in the lower qualities, to a considerable extent. The better qualities of round coal suitable for house-fire purposes are still moving off fairly well at about late rates. Best Wigan Arley still averages 12s. 6d.; Pemberton four-feet and second qualities of Arley, 10s. to 10s. 6d.; and common house-fire coals, 9s. to 9s. 6d. per ton, at the pit's mouth. The depression in the iron trade of this district is necessarily materially affecting requirements for the lower qualities of round coal; and these are hanging upon the market with prices easier—good, ordinary descriptions not fetching more than 8s. 6d. per ton. Engine classes of fuel are also again plentiful, and surplus lots have been pushed at low figures; while the threatened lock-out in the cotton trade gives anything but a hopeful outlook for the immediate future. Good qualities of burgy are still fetching about 6s. to 6s. 6d., and the best qualities of slack, 5s. to 5s. 6d.; but common sorts can be bought readily at about 3s. 6d. to 4s. per ton, at the pit's mouth. The shipping demand continues very limited; and with plentiful supplies again offering at the ports on the Mersey, ordinary steam coal has been readily obtainable, delivered at the Garston Docks or the High Level, Liverpool, at 10s. per ton, or even less.

Northern Coal Trade.—The coal trade is on the whole easier, the local consumption having been reduced, and there having been more coal brought from other parts. Best Northumbrian steam coal is in abundant supply, at from 10s. 9d. to 11s. per ton, f.o.b. There is also plenty of small steam coal, at from 4s. 9d. to 5s. per ton. The small quantity of gas coal that is being produced is very nearly all taken up on old contracts; but a little is being sold at about 12s. per ton, f.o.b. It is, however, significant that, while some gas companies bought in the early weeks of the strike, they are now refraining from doing so—which looks as if a speedy end were expected. A little coal is being imported, however, but the cost of carriage makes it dear. Bunker and manufacturing coals are dull, in consequence of the large number of steamers laid idle and of works laid off. Household coals are flat in price, the mild weather having limited the consumption. Coke is difficult to obtain locally, and as much as £1 per ton is asked for best blast-furnace kinds; but very little is made, and one or two users are drawing supplies from Yorkshire. Gas coke is rather steadier; and at Darlington the price has been put up, in consequence of the fuller demand. At the town named, a considerable increase in the consumption of gas is taking place.

Tarapaca Water-Works Company.—The Directors have declared a second dividend of 5 per cent., less income-tax, on account of the year ended Dec. 31 last.

The Weights and Measures (Purchase) Bill.—By this Bill, which was introduced by the President of the Board of Trade (Sir M. Hicks-Beach) on Monday last week, Parliament is asked to authorize county and borough councils to purchase the "franchise of weights and measures." This expression is defined as the authority which any court-leet, jury, or other person may now possess for inspecting, examining, regulating, verifying, stamping, adjusting, seizing, breaking, or destroying any weights or measures or any weighing or measuring instrument. It is proposed that county councils shall be enabled to borrow money for the purposes of the Act, in accordance with the Local Government Act, 1888; borough councils being empowered to borrow in accordance with the Public Health Act, 1875.

The Water Question at Mansfield.—Yesterday week a special meeting of the Mansfield Town Council was held to consider the best means of furnishing the town with a good water supply. At the last meeting it was resolved that Mr. Hodson, C.E., should modify his estimate so that the expense incurred in providing an additional supply should not exceed £20,000. A memorial from the Mansfield Owners' and Ratepayers' Association was, however, presented, protesting against the expenditure of so large a sum; and stating that, being dissatisfied with the decision arrived at, they had engaged the services of Mr. W. H. Dalton, F.G.S., who forwarded a report to the effect that, by deepening the present well, and driving headings in the direction indicated by the geological structure of the district, an ample supply of good and pure water could be obtained to supply the developments of the borough for years to come. After hearing the above report, the Mayor, (Mr. G. H. Hibbert) was requisitioned to call a special meeting to further consider the question.

Electric Lighting for Huddersfield.—Mr. R. Walton, M.Inst.C.E., held an inquiry at Huddersfield, last Thursday, relative to an application by the Huddersfield County Council for sanction to borrow £50,000 for electric lighting purposes. The Town Clerk (Mr. H. Barber), in support of the application, stated that the population of the borough was 95,417; the rateable value, £422,873; and the total indebtedness, £2,057,069. The Board of Trade issued two Electric Lighting Orders for the borough in 1890; and by the second one, it was provided that the Council should commence the works in the compulsory area within two years. The area of supply was the whole of the borough, with the exception of one portion, which was added after the Order was made—viz., the extensive district of Longwood. Mr. A. B. Mountain, the Electrical Engineer, produced plans of the generating house, in which he said provision would be made for 6660 8-candle incandescent lamps. Three dynamos on the Brush principle would be employed. There was no opposition.

Exhibition of Gas Appliances.—Last Tuesday, an exhibition of gas cooking and other apparatus supplied by the Davis Gas-Stove Company, Limited, was opened at the Central Hall, Walsall. During the afternoon and in the evening, Miss Ida Cameron gave lessons in cookery; there being a good attendance of ladies each time. Under the auspices of the Swansea Gas Company, Messrs. Thomas Fletcher, Russell, and Co., of Warrington and London, held an attractive exhibition of their various gas appliances in the Albert Hall during the past week. Fletcher's well-known patent cellular cast-iron "Indestructible" cooking-ranges took a prominent place; and round the hall were heating-stoves, coffee-roasters, water-heaters, smoothing-iron heaters, burners, &c., all in full working order. In the afternoon and evening of each day, Mrs. Wilkinson, late of the National School of Cookery, South Kensington, gave practical demonstrations on cooking by gas, before large audiences. A successful exhibition of gas appliances has just been held at Haslingden, at which Messrs. C. Wilson and Son and Messrs. John Wright and Co. showed various samples of their cooking and heating stoves. The exhibition was held under the auspices of the Gas Company, who had a stand of meters, samples of residuals, &c. Free tectures on cookery were delivered by Mrs. C. F. Pitcher.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 668.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c.	10	11½—12½	..	6 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 5
100,000	20	27 Nov.	8	Bahia, Limited	20	12—14	..	11 8 1
200,000	5	12 Nov.	7½	Bombay, Limited	5	6½—6¾	..	5 11 6
40,000	5	,,	7½	Do. New	4	4¾—5¼	..	5 14 1
380,000	Stck.	26 Feb.	12½	Brentford Consolidated	100	205—215	..	5 14 1
150,000	,,	,,	9½	Do. New	100	157—162	+2	5 14 2
220,000	20	11 Mar.	11½	Brighton & Hove Original	20	39—41*	..	5 12 2
888,500	Stck.	11 Mar.	5	Bristol	100	95-100*	..	5 0 0
320,000	20	15 Oct.	11½	British	20	43—45	..	5 0 0
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	14—15	..	5 13 4
328,750	10	—	—	Buenos Ayres (New) Limited	10	6—7	..	—
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	93—96	..	6 5 0
150,000	20	26 Feb.	8	Cagliari, Limited	20	24—26	..	6 3 1
550,000	Stck.	15 Oct.	13*a*	Commercial, Old Stock	100	242—247	−2	5 5 3
165,000	,,	,,	10*a*	Do. New do.	100	190—195	..	5 2 7
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118—123	..	3 13 2
800,000	Stck.	30 Dec.	13	Continental Union, Limited	100	221—226	..	5 15 1
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	185—195	..	5 5 7
75,000	Stck.	30 Mar.	10	Crystal Palace District	100	185—195*	..	5 2 7
486,090	10	29 Jan.	10	European, Limited	10	19—20	..	5 0 0
354,060	10	,,	10	Do. Partly paid	7½	14—15	..	5 0 0
5,470,820	Stck.	12 Feb.	12	Gaslight & Coke, A, Ordinary	100	212—217	..	5 10 7
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94—97	..	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	245—250	+1	4 0 0
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	116—121	..	4 2 9
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	169—174	..	4 6 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	153—156	+2½	4 9 9
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	241—246	..	4 1 3
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	146—150	+½	4 0 0
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	100	113—116	..	3 9 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	118—123	..	3 13 2
908,000	,,	,,	6	Do. 6 p. c. do	100	163—168	..	3 11 5
3,800,000	Stck.	12 Nov.	12	Imperial Continental	100	223—227	+1	5 5 8
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4—4½	..	6 13 4
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	106-108*	..	4 12 7
541,920	20	27 Nov.	6½	Monte Video, Limited	20	14½—15½	..	8 7 8
150,000	5	27 Nov.	10	Oriental, Limited	5	8¼—8¾	..	5 14 3
60,000	5	30 Mar.	7	Ottoman, Limited	5	4—5*	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	2½—3½	..	—
				People's Gas of Chicago—				
420,000	100	3 Nov.	6	1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	1 Dec.	6	2nd Do.	100	100—105	..	5 14 3
150,000	10	15 Oct.	10	San Paulo, Limited	10	9—10	..	10 0 0
500,000	Stck.	26 Feb.	15½	South Metropolitan, A Stock	100	267—272	+1	5 14 0
1,350,000	,,	,,	12	Do. B do.	100	220—225	..	5 6 8
200,000	,,	,,	13	Do. C do.	100	235—240	..	5 8 4
725,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	140—145	+2	3 9 0
600,000	Stck.	11 Mar.	11½	Tottenham & Edm'nton, Orig.	100	—	..	—
				WATER COMPANIES.				
729,331	Stck.	30 Dec.	10	Chelsea, Ordinary	100	243—248	+15½	4 0 8
1,720,560	Stck.	15 Oct.	8	East London, Ordinary	100	195—200	+4	4 0 0
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	136—140	..	3 4 3
700,000	50	11 Dec.	8	Grand Junction	50	95—98	+1	4 1 8
708,000	Stck.	12 Feb.	10½	Kent	100	240—250	..	4 4 0
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	210—215	+2½	4 8 4
406,200	100	,,	7½	Do. 7½ p. c. max.	100	180—185	..	4 0 0
260,000	Stck.	30 Mar.	4	Do. 4 p. c. Deb. Stk.	100	120—123*	..	3 5 0
500,000	100	12 Feb.	12½	New River, New Shares	100	320—330	..	3 13 6
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk.	100	125—128	..	3 2 6
902,300	Stck.	30 Dec.	6½	S'thwk & V'xhall, 10 p. c. max.	100	135—140	+2	4 12 10
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	125—135	..	4 16 3
1,155,066	Stck.	11 Dec.	10	West Middlesex	100	237—242	+1	4 2 8

*Ex div.

a Next dividends will be at this rate.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO., TELEPHONE No. 2698.

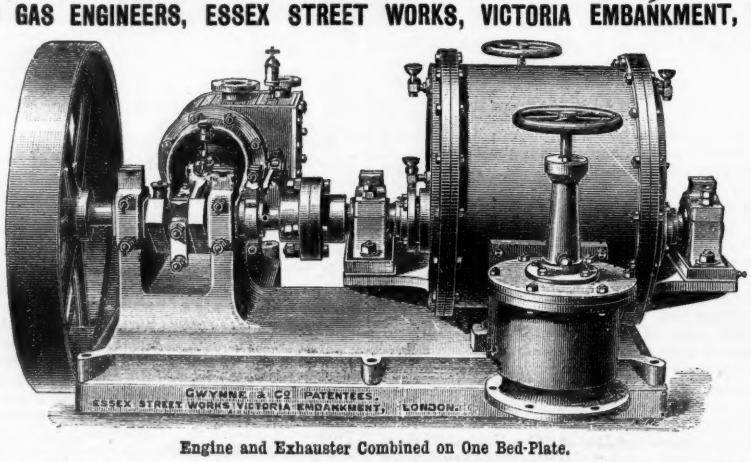
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

WINKELMANN'S "Volcanic" Fire CEMENT. (Fire resistance, 4500° Fahr.)
Prices, particulars, and directions for use on application to ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

OXIDE OF IRON FOR GAS PURIFICATION.

JAMES GORDON & Co., Brokers, can offer Cargoes of good quality; also 2500 tons of SPENT OXIDE.
Samples and price on application.
Address Borough Buildings, 7, Rumford Street, LIVERPOOL.

LIQUOR and Tar wanted.
BROTHERTON AND Co., Ammonia and Tar Distillers, LEEDS and WAKEFIELD.

LIQUID FUEL.

TAR Oils, Naphthalene, Oil Residues, Tar, Petroleum, &c. SADLER'S PATENT BURNER is the simplest and most effective. No smoke; no Ashes
For particulars and price of Burner and Cheap Oils, apply to SADLER AND Co., LIMITED, MIDDLESBROUGH.

OXIDE OF IRON.

TO MERCHANTS, BROKERS, EXPORTERS, &c.

ONE THOUSAND TONS offered for Gas Purification. Guaranteed quality. Shipped from Ireland to any Port. Agency might be given to first-class Firm.
Address No. 2086, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER requires an engagement as WORKING MANAGER in Gas-Works, Public or Private. Can take entire charge. Married, no family. Good references.
Address No. 2081, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Position as Assistant ENGINEER or CLERK OF WORKS in Gas-Works at home or abroad. Experience covers Contracting Engineer's Works four years, Superintending Gas-Works Extensions (now completing) three years. Efficient Draughtsman, and Quantities Clerk. Age 26.
Address No. 2088, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a thoroughly capable Man, a Situation as MAIN and SERVICE LAYER. Thirteen years' experience in a large Gas-Works in all branches, inside and out. Well up in all details connected with the Manufacture and Distribution of Gas. Good Smith, Mechanic, &c. Excellent Testimonials.
Address No. 2092, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, a Traveller for the Gas-Stove Business.
Apply, by letter only, to CHARLES WILSON AND SONS, Carlton Works, LEEDS.

WANTED, a thorough Gas-Fitter, of good address, principally for internal work, and able to intelligently advise upon Burners, Globes, Fires, and all similar points. Wages, 30s. Constant employment to a good man.
Address Mr. F. G. DEXTER, Gas-Works, WINCHESTER.

WANTED, a Gentleman to proceed to Brazil as ASSISTANT MANAGER to an English Company, of administrative capabilities, and with a technical knowledge of Gas and Water Works.
Commencing salary, £600 per annum, with prospect of soon becoming General Manager.
Knowledge of Portuguese or Spanish desirable.
Address, with full particulars, BRAZIL, care of J. W. Vickers, 5, NICHOLAS LANE, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. III., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

TO INVENTORS AND OTHERS.

PATENTS for Inventions Secured and TRADE MARKS REGISTERED throughout the World. Advice on all matters connected with the above. Handbook gratis on application.
J. C. CHAPMAN, C.E., Chartered Patent Agent, 70, Chancery Lane, LONDON.

WANTED, by the Gorleston and South- town Gas Company, a competent man as STOKER. Must be steady, and used to Shovel Charging. Married man, without family, preferred, to reside in Cottage on the Works.
Apply, with testimonials, to
W. PALGRAVE BROWN,
Secretary.
Southtown, Great Yarmouth.

WANTED, in the Secretary's Office of a Provincial Gas Company, an experienced and competent ASSISTANT, possessing a thorough knowledge of the Accounts and routine of a Gas Company's Office, of good address, and able to take entire charge in the absence of the principal. To a thoroughly efficient man, the appointment will offer considerable prospective advantages.
Applications, stating age, previous or present engagement, and salary required, may be made, in writing, to No. 2090, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.; or, if preferred, Mr. King will meet intending applicants by appointment.
Testimonials will not in the first instance be required.

FOR SALE—A 7000 Cubic Feet per hour BEALE'S EXHAUSTER, in good condition.
Apply to the MANAGER, Gas Company, DORKING.

FOR SALE, Second-Hand—
HORIZONTAL STEAM-ENGINE ("D" size)
FEED-PUMP, Tangyes'.
Two 6-inch VALVES.
EXHAUST GOVERNOR.
6-inch VERTICAL CONDENSERS.
8-inch COMPENSATING GOVERNOR.
TREADLE LATHE, 6-inch Centres, 4-feet Bed.
Particulars from JOHN M'COLL, Manager, Gas-Works, HALESOWEN.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OIL for the "Wells" or "Lucigen" Lamps.
HARDMAN AND Co., Miles Platting, MANCHESTER.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. III., centre of JOURNAL.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88a, LEADENHALL STREET, E.C.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. FEATHERSTONE, 173, Fentiman Road, LONDON, S.W.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
LUX's Gas Regulators for every consumption.
LUX's single-stem Pressure-Gauges.
LUX's Regulator for Gas-Engines.
LUX's Gas-Balance.
LUX's new Gas Regulator for Inverted Lamps an other Apparatus for Gas Lighting, &c.

TO INVENTORS.

A NEW Idea Wanted in Small GAS- STOVES for Boiling Kettles. Must be without smell.
Apply to No. 2091, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MARSDEN LOCAL BOARD.

FOR SALE—One 5-inch Station Meter, in round Cast-Iron Case, Bye-Pass, and all complete. Can be seen working.
Particulars from HENRY GILL, Manager.

GAS-METERS FOR SALE.

THE Royal Agricultural Hall Company, Limited, Islington, have FOR SALE one 500-LIGHT DRY METER, and one 200-LIGHT DRY METER, which until recently have been used at the Hall, and are in good working order.
Apply to R. VENNER, Secretary, Royal Agricultural Hall Company, Limited, ISLINGTON.

NEWMARKET GAS COMPANY.

PURIFIERS FOR SALE.

A SET of Four Purifiers, 10 feet square, with 10-inch Dry Centre-Valve and Connections, Covers, Bearing-Bars, Grids, and Overhead Lifting Apparatus complete, all in good working order, and might be re-erected equal to new.
For further particulars, apply to
J. H. TROUGHTON,
Manager and Secretary.
Gas-Works, Newmarket,
April 6, 1892.

LIVESEY WASHER FOR SALE.

THE Dewsbury Corporation have for DISPOSAL a LIVESEY WASHER of the capacity of 1,000,000 cubic feet per day.
The Washer is about to be replaced by Apparatus of larger capacity, and can now be seen in actual use at the Savile Town Gas-Works, Dewsbury, on application to Mr. Charles A. Craven, Engineer, from whom further particulars can be obtained.
E. MAWDESLEY, Town Clerk.
Town Hall, Dewsbury,
April 6, 1892.

WALLASEY GAS AND WATER WORKS.

GAS EXHAUSTER FOR SALE.

THE Wallasey Local Board offer for SALE a 10,000 cubic feet per hour ANDERSON'S EXHAUSTER, with Engine combined.
The Exhauster is in good condition, and has only been taken out to make room for one of larger size.
Any further information can be obtained on application to Mr. H. Ashton Hill, C.E., at the Gas-Works, Great Float, near Birkenhead.
Sealed tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Exhauster," to be delivered at my Office, as below, not later than Five o'clock in the Evening of Monday, the 25th inst.
The Board do not bind themselves to accept the highest or any tender.
By order,
W. DANGER,
Clerk to the Board.
Public Offices, Egremont, Cheshire,
April 8, 1892.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

LEIGH LOCAL BOARD.

FOR SALE (cheap)—One 20,000 cubic feet per hour GAS EXHAUSTER and STATION METER, both complete with Valves and Connections. Particulars from

A. T. FLETCHER,
Engineer and Manager.

Gas-Works, Leigh, Lancs.,
April 1, 1892.

BOROUGH OF WARRINGTON.
(GAS DEPARTMENT.)

TO BUILDERS.

THE Gas Committee of the above Cor- poration invite TENDERS for the Erection of a GAS TANK and EXCAVATION for same.

Full particulars can be obtained on application to Mr. W. S. Haddock, Engineer to the Department.

Sealed tenders (endorsed) to be addressed to the Chairman of the Gas Committee, and sent in not later than the 21st inst.

The lowest or any tender will not be necessarily accepted.

FREDK. TAYLOR,
Secretary.

Gas Offices, Mersey Street,
Warrington, April 1, 1892.

CITY OF BIRMINGHAM.

TENDERS FOR AMMONIACAL LIQUOR.

THE Gas Committee invite Tenders for the purchase of the AMMONIACAL LIQUOR produced at their Works during a period of Ten years, beginning on July 1, 1893.

The quantity produced in the year ended March 31, 1891, was 13,682,000 gallons of 10-oz. Liquor.

Provision may be made for dealing with the Liquor either in Works now erected on Land belonging to the Corporation, or on Land to be let for the erection of new Works.

Copies of the conditions on which tenders are invited may be obtained on application to

EDWIN SMITH,
Secretary.

City Gas Offices, Council House,
Birmingham.

BOROUGH OF CHORLEY.

TO RETORT, ETC., MANUFACTURERS.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the supply of 55 ⌂-shaped GAS-RETORTS, 15 in. by 13 in. by 9 ft. 6 in. long; 9 ⌂-shaped RETORTS, 20 in. by 15 in. by 9 ft. 6 in. long, and three Oval RETORTS, 20 in. by 15 in. by 9 ft. 6 in. long; 10,000 FIRE-BRICKS; and about 15 tons of ground FIRE-CLAY for setting same.

Any further information may be obtained on application to the Gas Manager, Mr. Wm. Blackledge, at the Gas-Works, Water Street, Chorley.

Tenders, endorsed "Tender for Retorts, &c.," to be sent to me not later than the 19th inst.

By order,
THOS. A. JACKSON,
Town Clerk.

Town Hall, Chorley,
April 7, 1892.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply and erection of—

(1) Two Cast-Iron PURIFIERS, 24 ft. by 24 ft. by 7 ft., with Wrought-Iron Covers, Cast-Iron Connections, and Valves complete; also for the supply of 30-inch and 24 inch SPECIAL CASTINGS.

(2) About 158 feet run of 24-inch and 18-inch Wrought-Iron FOUL MAINS.

Full particulars can be obtained on application to the Gas Engineer, Millgate Gas-Works.

Sealed tenders, endorsed "Tender for Purifiers," addressed to the Chairman of the Gas Committee, Gas Office, Stockport, to be received on or before the 28th inst.

The Committee do not bind themselves to accept the lowest or any tender.

Contractors will be expected to pay the average rate of wages paid in the district.

By order,
WALTER HYDE,
Town Clerk.

Stockport, April 7, 1892.

CITY OF MANCHESTER.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee are prepared to receive, on or before Thursday, the 28th day of April inst., OFFERS of HIGH-CLASS CANNELS and COALS, suitable for Gas Making, for delivery at their Gaythorn, Rochdale Road, and Bradford Road Works, during a period of One, Two, or Three years, commencing the 1st of July, 1892.

Particulars and printed Forms of Tender may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent, Gas Department, Town Hall, Manchester.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
April 8, 1892.

TENDERS FOR GAS COAL.

THE Corporation of Droitwich invite TENDERS for the supply of about 1100 tons of best screened GAS COAL, at per ton of 21 cwt., to be delivered free at Droitwich (G.W.) Railway Station at such times and in such quantities as may be required.

The contract will be for One year, commencing on the 1st prox.

Tenders (with analysis of the Coal to be supplied), properly endorsed "Tender for Gas Coal," to be sent to the undersigned on or before the 23rd inst.

The Corporation do not bind themselves to accept the lowest or any tender.

S. JOHN TOMBS,
Town Clerk.

Droitwich, April 4, 1892.

TENDERS are invited for the Con- struction and Erection of Four PURIFIERS, VALVES, CONNECTIONS, and GIRDERS, at the Corporation Gas-Works, Hooley Bridge, Heywood.

Plans may be seen, and Specification and Form of Tender obtained, upon application to Mr. James Diggle, C.E., Borough Engineer, Heywood, on payment of a deposit of Two Guineas, which will be returned on the receipt of a *bonâ fide* tender.

Tenders, endorsed "Purifiers," to be sent in to the undersigned not later than the 19th of April, 1892.

The lowest or any tender will not necessarily be accepted.

By order,
ALFRED WALLIS,
Town Clerk.

Town Clerk's Office, Heywood,
March 30, 1892.

BOROUGH OF DARWEN.
(GAS AND WATER DEPARTMENTS.)

THE Corporation are prepared to receive TENDERS for the supply of—

(*a*) Cast-Iron Pipes and Specials.
(*b*) Lead, Lead Pipes, and Block Tin.
(*c*) Retorts, Fire Bricks, Lumps, Clay, &c., for the year ending the 31st of March, 1893.

Further particulars can be obtained from Mr. Thos. Duxbury, Gas-Works, Darwen.

Sealed tenders, endorsed "Gas and Water Annual Contracts," to be delivered at my Office at or before Noon, on Monday, the 25th of April.

No tender necessarily accepted.

By order,
CHAS. COSTEKER,
Town Clerk.

Town Clerk's Office, Darwen,
April 7, 1892.

FARNHAM GAS COMPANY, LIMITED.

TENDERS FOR COAL.

THE Directors of the Farnham Gas Com- pany, Limited, are prepared to receive TENDERS from Persons willing to supply and deliver, free of all Dues and Charges, at the Farnham Station, London and South-Western Railway, 1900 tons of the following descriptions of GAS COAL—viz., New Pelton, Pelaw Main, Aldwarke Main, or Strafford Silkstone—to be delivered in quantities of 50 tons (at intervals) before the 28th of February, 1893. The Coals to be consigned to the order of the Farnham Gas Company, Limited, at the Farnham Railway Station.

In the case of Seaborne Coal, the Meter's Certificate of each quantity to be duly sent with Invoice of same.

Payment, monthly, two days after the ordinary meeting of the Directors.

Sealed tenders, marked "Tender for Coal," to be delivered to the Secretary, Mr. W. Wells, 112, West Street, Farnham, Surrey, not later than Eleven o'clock a.m., on Monday, the 2nd of May, of whom forms of tender may be obtained.

The Directors reserve the right to reject the lowest or any tender.

April 12, 1892.

MESSRS. Wheatley and Mackenzie beg to say that they have acquired the business of the late W. H. BENNETT, Esq., and that having a special experience in matters connected with Gas, Water, and Sanitary Improvement, will continue to give the same assistance to Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, or LETTERS PATENT.

Patents completed or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to WHEATLEY AND MACKENZIE, 40, Chancery Lane, LONDON, W.C.

TENDERS FOR CAST-IRON PIPES.

THE Dovor Gaslight Company invite TENDERS for the supply of 4892 yards lineal of 4-inch CAST-IRON SOCKET PIPES, weight per lineal yard 54 lbs. Also about 917 yards of 3-inch CAST-IRON SOCKET PIPES, weight per lineal yard 42 lbs. To be delivered on the Quay in Dover Harbour, free of all dues and charges.

Parties tendering should state the earliest date they can deliver, as early delivery is essential, and will be made of the essence of the contract.

The Company are not bound to accept the lowest or any tender.

Tenders to be delivered before Twelve o'clock noon, on Monday, the 25th inst., to the undersigned, marked "Tender for Pipes."

G. FIELDING,
Secretary.

14, Snargate Street, Dover,
April 11, 1892.

IMPERIAL CONTINENTAL GAS ASSOCIATION,
INCORPORATED BY ACT OF PARLIAMENT.

NOTICE is hereby given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 3rd day of May next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors, a Dividend declared for the Half Year ended the 31st of December last, and the usual Ordinary Business of such Meeting transacted.

Notice is hereby also given, that the Transfer Books will be closed from the 19th inst. to the 3rd of May, both days inclusive.

By order of the Board,
R. S. GARDINER,
Secretary.

30, Clement's Lane, Lombard Street,
London, E.C., April 11, 1892.

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SALE OF 1150 SHARES.

MR. ALFRED RICHARDS is favoured with instructions from the Directors TO SELL BY AUCTION, at the Mart, E.C., on Thursday, April 21, at Two o'clock precisely, in Lots of ten Shares each, 1150 £10 SHARES in the West Ham Gas Company.

The Standard Dividend authorized by the Company's Act of Parliament is 7 per cent., subject to the usual Sliding Scale Clauses.

Particulars may be obtained at the MART; of the SECRETARY to the Company, STRATFORD, E.; of Messrs. HILLEARY, Solicitors, 5, FENCHURCH BUILDINGS, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

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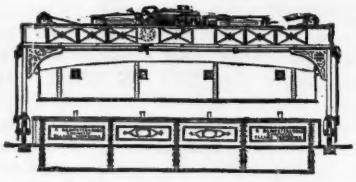

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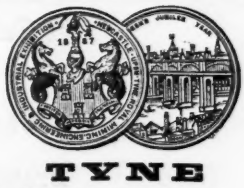

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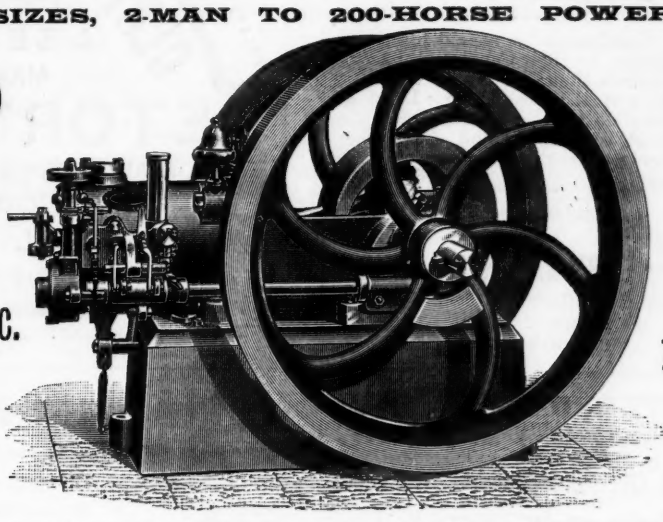

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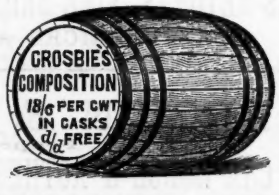

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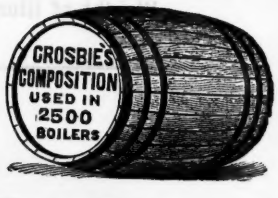

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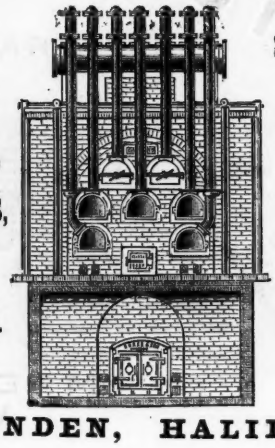

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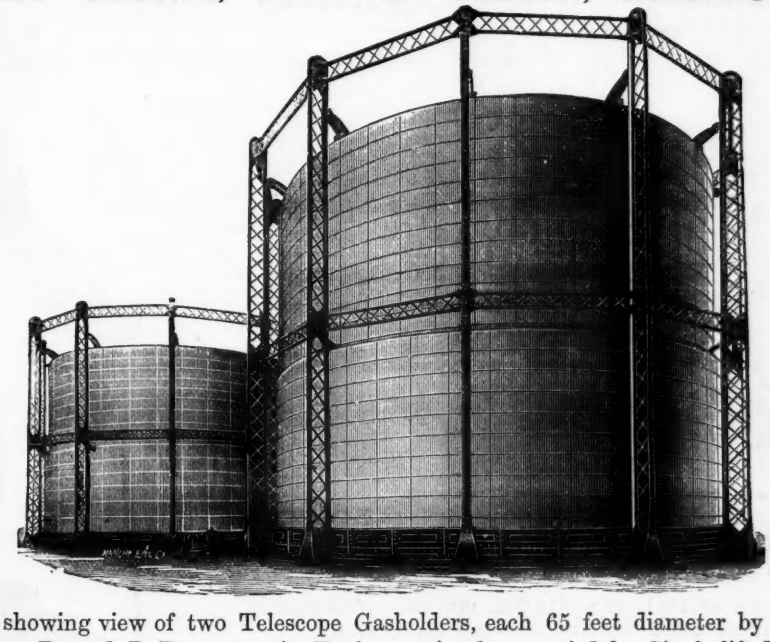

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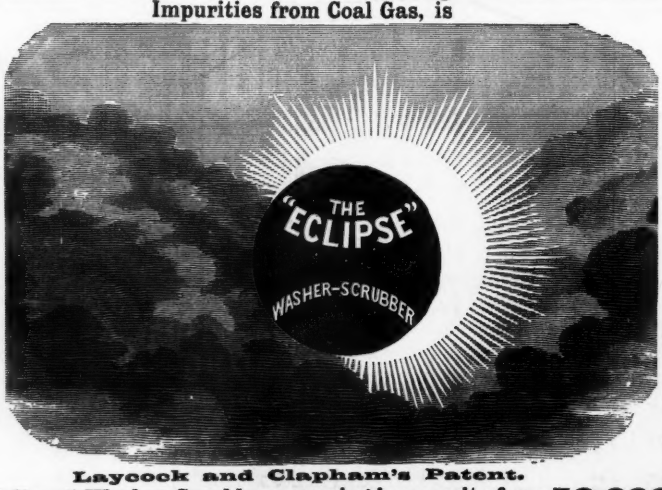

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